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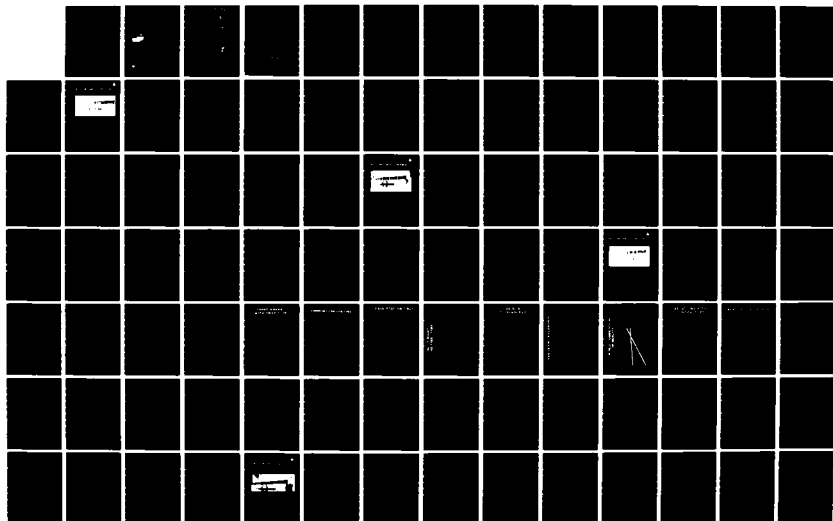
BOTTOM LINE II CONFERENCE QUALITY -- THE VITAL LINK IN
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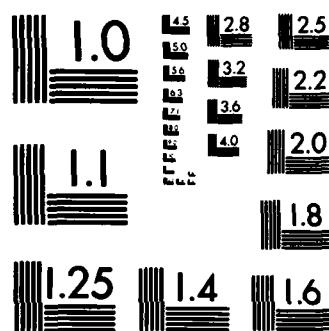
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BOTTOM LINE II CONFERENCE FINAL REPORT



**QUALITY – THE VITAL LINK IN
PRODUCTION AND READINESS**

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WASHINGTON, D. C.

1 JUNE 1983





BOTTOM LINE II CONFERENCE

1 JUNE 1963

FORT MONMOUTH, WASHINGTON, D.C.

INTRODUCTION

The conference was held under the sponsorship of the Office of the Secretary of Defense, and was hosted by the Defense Logistics Agency. The primary theme was -- Quality - The Vital Link in Production and Readiness.

During the conference, top-level Government officials met with industry Chief Executive Officers to express their growing concern regarding the overall quality and reliability of defense equipment. Highlighted was the fact that poor quality adversely impacts the readiness of our Armed Forces; the cost of weapon systems, and our image as the world's industrial leader. Company executives can reverse the current trends by recognizing that quality is the bottom line, and is a top management responsibility.

I am most grateful for the excellent presentations made by all the speakers, and I sincerely appreciate the interest displayed by the Chief Executive Officers, or their representatives, who participated in the conference.

John A. Cristead
E. A. CRISTEAD
Vice Admiral, SC, USN
Director



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BOTTOM LINE II CONFERENCE

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BOTTOM LINE II CONFERENCE AGENDA

QUALITY - VITAL LINK IN PRODUCTION AND READINESS

NATIONAL DEFENSE UNIVERSITY (BARUCH AUDITORIUM)

FT. LESLEY J. McNAIR, WASHINGTON, D.C.

JUNE 1, 1983

7:45 - 8:20 REGISTRATION

**8:20 - 8:25 OPENING CEREMONY AND INVOCATION, REAR ADMIRAL F. C. COLLINS, JR., USN,
EXECUTIVE DIRECTOR, QUALITY ASSURANCE, DEFENSE LOGISTICS AGENCY**

**8:25 - 8:35 OPENING REMARKS BY VICE ADMIRAL E. A. GRINSTAD, SC, USN, DIRECTOR,
DEFENSE LOGISTICS AGENCY**

**8:35 - 9:00 KEYNOTE SPEAKER - THE HONORABLE PAUL THAYER, DEPUTY
SECRETARY OF DEFENSE**

**9:00 - 9:20 DEFENSE INTELLIGENCE AGENCY THREAT ASSESSMENT BRIEFING (In accordance
with DIA request, this briefing is not included in this BL II report)**

9:20 - 9:35 QUESTIONS AND COMMENTS

9:35 - 10:30 PANEL 1 - USERS LOOK AT QUALITY

**MODERATOR: GENERAL CHARLES A. GABRIEL, USAF, CHIEF OF STAFF,
U.S. AIR FORCE**

**MEMBERS : ADMIRAL SYLVESTER R. FOLEY, JR., USN,
COMMANDER-IN-CHIEF, U.S. PACIFIC FLEET
GENERAL P. X. KELLEY, USMC, ASSISTANT COMMANDANT AND
CHIEF OF STAFF, U.S. MARINE CORPS
LIEUTENANT GENERAL ROBERT W. BAZLEY, USAF, VICE
COMMANDER-IN-CHIEF, U.S. AIR FORCES IN EUROPE
GENERAL WILLIAM R. RICHARDSON, USA, COMMANDING GENERAL
TRAINING AND DOCTRINE COMMAND**

10:30 - 10:50 PANEL 1 DISCUSSION

10:50 - 11:05 REFRESHMENT BREAK

**11:05 - 12:00 PANEL 2 - INDUSTRY LOOKS AT DEFENSE CONTRACTING AND ITS
IMPACT ON QUALITY**

**MODERATOR: MR. THOMAS J. MURRIN, PRESIDENT, ENERGY AND ADVANCED
TECHNOLOGY GROUP, WESTINGHOUSE ELECTRIC CORPORATION**

**MEMBERS : MR. ROY ANDERSON, CHAIRMAN OF THE BOARD AND CHIEF
EXECUTIVE OFFICER, LOCKHEED CORPORATION
MR. DAVID PACKARD, CHAIRMAN OF THE BOARD, HEWLETT-
PACKARD COMPANY
MR. WILLIAM J. WEISS, VICE CHAIRMAN OF THE BOARD AND
CHIEF OPERATING OFFICER, MOTOROLA, INCORPORATED
MR. WILLIAM E. HARRIS, PRESIDENT AND CHIEF OPERATING
OFFICER, BATH IRON WORKS, INCORPORATED**

12:00 - 12:20 PANEL 2 DISCUSSION

12:20 - 1:40 LUNCH - HOSTED BY THE DEPARTMENT OF DEFENSE, FORT McNAIR CLUB

1:40 - 2:35 PANEL 3 - PROFESSIONAL QUALITY LOOKS AT INDUSTRY

MODERATOR: MR. NORMAN AUGUSTINE, PRESIDENT, DENVER AEROSPACE,
MARTIN-MARIETTA

MEMBERS : DR. JOSEPH M. JURAN, CHAIRMAN, JURAN INSTITUTE, INC.
DR. J. STUART HUNTER, PROFESSOR EMERITUS, DEPARTMENT
OF ENGINEERING, PRINCETON UNIVERSITY
DR. A. V. FEIGENBAUM, CHIEF EXECUTIVE OFFICER, GENERAL
SYSTEMS CORPORATION
DR. ALVIN GUNNISON, CHIEF EXECUTIVE OFFICER, THE
GUNNISON GROUP, INTERNATIONAL

2:35 - 3:00 PANEL 3 DISCUSSION

3:00 - 3:20 REFRESHMENT BREAK

3:20 - 4:30 PANEL 4 - PROGRAM MANAGEMENT AND PROCUREMENT IN DOD

MODERATOR: HONORABLE JAMES P. WADE, JR., PRINCIPAL DEPUTY UNDER
SECRETARY OF DEFENSE, RESEARCH AND ENGINEERING

MEMBERS : HONORABLE GEORGE A. SAWYER, THE ASSISTANT SECRETARY OF
THE NAVY (SHIPBUILDING AND LOGISTICS)
VICE ADMIRAL E. A. GRINSTEAD, SC, USN, DIRECTOR,
DEFENSE LOGISTICS AGENCY
MAJOR GENERAL JERRY BUNYARD, USA, PATRIOT PROJECT
MANAGER
MAJOR GENERAL WILLIAM THURMAN, USAF, B-1 PROGRAM
MANAGER
REAR ADMIRAL WAYNE E. MEYER, USN, PROJECT MANAGER,
AEGIS SHIPBUILDING

4:30 - 4:55 PANEL 4 DISCUSSION

4:55 - 5:25 SUMMATION AND CONCLUSIONS BY HOWARD K. SMITH, COMMENTATOR

5:30 - 6:30 RECEPTION - HOSTED BY THE DEPARTMENT OF DEFENSE, FORT McNAIR CLUB

OPENING REMARKS

BY

VICE ADMIRAL E. A. GRINSTEAD, SC, USN
DIRECTOR, DEFENSE LOGISTICS AGENCY

DISTINGUISHED GUESTS, LADIES AND GENTLEMEN. I AM PLEASED TO WELCOME YOU TO THE SECOND ANNUAL BOTTOM LINE CONFERENCE.

I PARTICULARLY WISH TO EXPRESS MY APPRECIATION TO EACH DEFENSE CONTRACTOR EXECUTIVE AND THE SERVICE REPRESENTATIVES FOR YOUR ATTENDANCE HERE TODAY. WE ARE LOOKING FORWARD TO YOUR ACTIVE PARTICIPATION IN THE PROGRAM, SO THAT ALL MAY REAP A RETURN ON OUR INVESTMENT OF TIME. I BELIEVE THAT YOU WILL EXPERIENCE A SERIES OF HIGHLY PRODUCTIVE SESSIONS WHICH WILL STIMULATE YOUR INTEREST IN THE BOTTOM LINE CONCEPT -- AND WILL ULTIMATELY LEAD TO FURTHER ACHIEVEMENTS IN YOUR CORPORATE ENDEAVORS.

THE FIRST BOTTOM LINE CONFERENCE WAS DEVELOPED FROM THE DEPARTMENT OF DEFENSE'S RECOGNITION

- OF - THE INTERNATIONAL CHALLENGE TO THE QUALITY OF AMERICAN MADE PRODUCTS,
- THE ASSOCIATED EFFECTS ON PRODUCTIVITY--COSTS--SALES AND PROFIT--AND
- THE RELATIONSHIP OF THESE ADVERSE TRENDS TO OUR NATION'S ECONOMIC AND DEFENSE POSTURE.

IN MAY, LAST YEAR, WE INVITED YOU TO LISTEN TO TOP LEVEL GOVERNMENT AND INDUSTRY EXECUTIVES. THE POSITIVE RESPONSE WAS OVERWHELMING--WE DREW A CAPACITY AUDIENCE. SOME OF THE TOPICS OUR SPEAKERS DISCUSSED WERE:

- PRESIDENT REAGAN'S PLAN TO REVITALIZE OUR NATION'S DEFENSE POSTURE--AND THE KEYSTONE OF THE PLAN, THE DEFENSE BUDGET.
- THE NEED TO MEET THE CHALLENGE OF FOREIGN COMPETITION--AND TO DO IT "QUICKLY".
- THE IMPORTANCE OF THE ROLE OF QUALITY IN THE DEFENSE BUSINESS AND THE KEY ROLE OF UPPER MANAGEMENT IN ESTABLISHING A DEMANDING QUALITY STRATEGY AND PERFORMANCE GOALS.
- INNOVATIVE QUALITY AND PRODUCTIVITY IMPROVEMENT PROGRAMS--AND THE TREMENDOUS RESULTS SOME COMPANIES HAVE ALREADY EXPERIENCED.
- GOVERNMENT AND INDUSTRY COOPERATION IN CONTRACTING TO ACHIEVE MUTUAL OBJECTIVES.
- THE RELATIONSHIP BETWEEN THE QUALITY AND RELIABILITY OF DEFENSE SYSTEMS AND THE OPERATIONAL READINESS OF OUR MILITARY FORCES.

I AM SURE ALL OF OUR SPEAKERS CAME TO THE SAME CONCLUSIONS--"QUALITY IS THE BOTTOM LINE AND QUALITY IS A TOP MANAGEMENT RESPONSIBILITY THAT REALLY CANNOT BE DELEGATED."

THESE CONCLUSIONS INDICATED TO US THE NEED TO LOOK AT BETTER MEANS TO EDUCATE GOVERNMENT AND INDUSTRY PERSONNEL IN QUALITY PRACTICES AND MANAGEMENT. WE HAVE FOUND THAT THERE ARE ONLY A FEW COLLEGES AND UNIVERSITIES WHICH EVEN OFFER COURSES IN THIS FIELD. AS A RESULT OF OUR STUDIES, WE DECIDED TO ALSO CONDUCT A BOTTOM LINE ACADEMIA CONFERENCE. ON APRIL 28TH, WE GATHERED TOGETHER SOME 300 REPRESENTATIVES FROM COLLEGES, UNIVERSITIES, INDUSTRY AND GOVERNMENT TO DISCUSS PROGRAMS TO FOSTER QUALITY EDUCATION. SOME INTERESTING PROPOSALS WERE OFFERED AND THEY WILL BE REVIEWED BY A SELECT GROUP REPRESENTING EACH OF THE SECTORS INVOLVED. EDUCATIONAL INSTITUTIONS ARE BECOMING AWARE OF OUR NEED AND WE ANTICIPATE THEIR SUPPORT. INDUSTRY MUST PROVIDE THE ENCOURAGEMENT TO EXPEDITE A VIABLE PROGRAM FOR EDUCATING CURRENT AND FUTURE MANAGERS IN THE PRECEPTS OF QUALITY.

SINCE THE FIRST BOTTOM LINE CONFERENCE, WE HAVE HEARD FROM MANY PARTICIPANTS. NOVEL APPROACHES TO IMPROVEMENTS IN QUALITY PROGRAMS ARE BEING EXPLORED AND IMPLEMENTED: -- TECHNOLOGICAL ADVANCEMENTS ARE BEING APPLIED BY INDUSTRY--AUTOMATED PROCESSING AND TESTING, ROBOTICS, MECHANIZATION OF MANUFACTURING OPERATIONS ARE BUT A FEW EXAMPLES OF THE CHANGES WE ARE WITNESSING.

IT APPEARS THAT A SOMEWHAT SLEEPY GIANT "THE AMERICAN INDUSTRY" CAN BE REAWAKENED TO AGAIN TAKE THE LEAD. THERE IS POSITIVE EVIDENCE THAT BOTTOM LINE CONCEPTS CAN PLAY AN IMPORTANT ROLE IN THIS COUNTRY'S SUCCESSFUL RETURN TO PRIOR SUPERIORITY IN THE INTERNATIONAL MARKET.

- WE SEE THE VITAL SIGNS OF IMPROVEMENTS IN OUR NATION'S ECONOMY, A PRELUDE TO A HIGH LEVEL OF INDUSTRIAL ACTIVITY.
- THERE IS AN INCREASE IN THE AWARENESS OF THE IMPORTANCE OF QUALITY TO THE REAL CORPORATE "FINANCIAL" BOTTOM LINE. WE NOW SEE AND HEAR CORPORATE EXECUTIVES TALKING IN TERMS OF QUALITY IMPROVEMENTS IN TV COMMERCIALS, MAJOR COMPANIES ARE ADVERTISING THE HIGHER QUALITY LEVELS OF THEIR PRODUCTS. THIS IS AN AWAKENING TO THE CONSUMER'S REACTION TO DEFECTIVE PRODUCTS AND POOR SERVICES.
- IN THE DEPARTMENT OF DEFENSE, WE FEEL THAT WE CAN INCREASE THIS NATION'S AWARENESS BY PRESSING FOR QUALITY ENHANCEMENT OF THE NATION'S INDUSTRIAL OUTPUT. WE BELIEVE THERE CAN BE A FANTASTIC MOMENTUM GENERATED FOR THIS NATION'S MEETING THE COMPETITION IN THE PRODUCTION OF HIGH QUALITY PRODUCTS! THIS IS WHY WE INVITED YOU TO BE HERE TODAY.

BOTTOM LINE II WILL GIVE YOU AN OPPORTUNITY TO BECOME DIRECTLY INVOLVED. OUR DISTINGUISHED KEYNOTE SPEAKER, THE HONORABLE PAUL THAYER, DEPUTY SECRETARY OF DEFENSE, WILL OPEN OUR PROGRAM AND WILL BE FOLLOWED BY A "THREAT ASSESSMENT BRIEFING" BY THE DEFENSE INTELLIGENCE AGENCY.

WE HAVE IDENTIFIED FOUR MAJOR TOPICS FOR PANEL DISCUSSIONS, WHICH ENCOMPASS THE THEME OF OUR CONFERENCE: QUALITY--THE VITAL LINK IN PRODUCTION AND READINESS. THESE TOPICS ARE:

- USERS LOOK AT QUALITY
- INDUSTRY LOOKS AT DEFENSE CONTRACTING AND IT'S IMPACT ON QUALITY
- PROFESSIONAL QUALITY LOOKS AT INDUSTRY -- AND FINALLY
- PROGRAM MANAGEMENT AND PROCUREMENT IN DOD

EACH PANEL WILL BE UNDER THE DIRECTION OF A MODERATOR, WHO IS EMINENTLY QUALIFIED IN THE SUBJECT, AND SUPPORTED BY DISTINGUISHED REPRESENTATIVES FROM VARIOUS ORGANIZATIONS WHICH RELATE TO THE SUBJECT. YOU WILL BE INVITED TO OFFER YOUR COMMENTS ON THE PANELISTS' PRESENTATIONS.

THE LAST ITEM ON OUR AGENDA IS A SUMMATION AND CONCLUSIONS BY THE REKNOWNED MEDIA COMMENTATOR, MR. HOWARD K. SMITH.

AFTER THE COMPLETION OF OUR AFTERNOON SESSION, YOU ARE INVITED TO PARTICIPATE IN A DOD RECEPTION AT THE FORT McNAIR CLUB --- WHERE WE CAN CONTINUE THE DISCUSSIONS IN AN INFORMAL ATMOSPHERE.

TO OPEN OUR PROGRAM, I HAVE THE DISTINCT PLEASURE OF INTRODUCING OUR DISTINGUISHED KEYNOTE SPEAKER--THE HONORABLE PAUL THAYER, DEPUTY SECRETARY OF DEFENSE. I THINK MR. THAYER IS A PERFECT SELECTION TO PRESENT THE KEYNOTE ADDRESS AT THIS CONFERENCE.

- AS A U.S. NAVY FIGHTER PILOT AND COMBAT ACE DURING WORLD WAR II HE HAS BEEN THE ULTIMATE USER OF A MILITARY HARDWARE SYSTEM.
- THROUGH HIS EXPERIENCE AS CHIEF EXPERIMENTAL FLIGHT TEST PILOT HE IS THOROUGHLY FAMILIAR WITH THE NEED FOR QUALITY IN DESIGN AND BUILT-IN RELIABILITY.
- HE IS NO STRANGER TO THE BOARD ROOM, INCLUDING THE CEO CHAIR AND THE PRESSURES OF THE PRESIDENCY OF A MAJOR U.S. CORPORATION. HE HAS SERVED IN EACH OF THESE CAPACITIES.

IN DECEMBER OF 1982, PRESIDENT REAGAN APPOINTED OUR ILLUSTRIOUS SPEAKER TO BE DEPUTY SECRETARY OF DEFENSE. HE WAS QUICKLY CONFIRMED BY THE SENATE, TAKING HIS OATH OF OFFICE ON JANUARY 12, 1983.

LADIES AND GENTLEMEN, JOIN ME IN WELCOMING OUR DISTINGUISHED KEYNOTE SPEAKER, THE DEPUTY SECRETARY OF DEFENSE, THE HONORABLE PAUL THAYER.....

KEYNOTE ADDRESS BY
THE HONORABLE PAUL THAYER
DEPUTY SECRETARY OF DEFENSE

I am wearing a new hat these days. After many years as a pilot, and then as a defense contractor, I'm now sitting on the other side of the table. Of course, I am still on the steep part of the learning curve. All the same, I would like to discuss with you today some of my thoughts about the challenge we face in making sure our military gets the quality equipment they need to do their job.

The first challenge we face is a challenge to quality itself. Not that it's ever put that way. Critics of the defense budget can no longer get away with arguing that we need less defense, or that the Soviet Union poses no threat to peace. After twenty years of Soviet military buildup the facts can no longer be ignored. Now we are hearing a new argument -- which is more popular, and more seductive. This is the argument that we can get more for less.

It is worth taking a closer look at some of the proposals which claim to give us stronger forces with weaker budgets. More often than not, what the defense critics are really proposing is not "more for less," but "more of the same -- only less." More specifically, what many of our critics on and off Capitol Hill propose is scrapping the lion's share of President Reagan's proposed force modernization program: The MX, the B1 Bomber, the M1 tank, the F-14, F-15, and F-18 fighter aircraft, and the Navy's new Capital ships and major combatants, to name some of the larger proposed cancellations and reductions. In this case, the slogan "less is more" really translates into "we can make do with what we have now." The simple fact is we cannot.

U.S. Military forces are simply being depleted by old age. Our newest B-52 came off the production line in 1962. The Army's main battle tank originated in the early '60s. Our Navy has shrunk from about 1,000 ships in the mid-sixties to 453 ships during the 1970s. As you know from your own businesses, delaying capital investment hurts quality, raises costs, and lowers efficiency.

But there is more to the argument that we can get stronger forces with weaker budgets -- we must also answer the claim that we have chased a false vision of technological quality and sacrificed both quantity and performance.

Too often critics of our high technology programs fail to ask if their proposals take advantage of our adversaries' weaknesses -- or our own strengths.

We do not count on matching the Soviets man for man or tank for tank. We are forced to rely on superior technology, not only because we have a qualitative edge, but also because we place a high value on our most precious resource: People.

You will often hear the argument that we should buy, to use a commonly cited example, far more comparatively inexpensive planes, instead of fewer, more sophisticated planes that have higher unit costs. Leaving aside a very important debate about whether the simpler planes would be better off in battle -- especially at long distances or in bad weather and against the most advanced Soviet aircraft.

Technology is not only a great force multiplier, it also saves lives. In 1943, for example, the allies flew two raids against the ball-bearing factories at Schweinfurt, Germany. The second raid consisted of 291 B-17s, which destroyed approximately two-thirds of the factory's productive capabilities. But sixty B-17s, with 600 crewmembers, did not return. Today you could deliver the same tonnage on target with a small fraction of the planes and people required then. What is more, the penetrating aircraft's electronic countermeasures and tactics would give it a far better chance of survival.

We have chosen to defend our nation with volunteer armed forces. This choice reflects our respect for individual freedom, and our hatred of compulsion, but it is not cheap. Personnel-related costs are close to half of our defense budget as compared to approximately 15% for the Soviets. And our weapons and equipment must reflect the high productivity we count on from our men and women in uniform, as well as the high value we place on their lives. So those who tell us we can get more for less better also tell us how we can get "more" with our existing personnel -- especially if Congress freezes our active-duty forces at current levels.

But that doesn't mean all the tough questions go to our critics. Every time a story appears in the newspaper about expensive military hardware that doesn't make the grade, every time there's a story on TV about spare parts that cost many times what they should, the credibility of attacks on the defense budget goes up.

As we all know, the cost of correcting defects in our weapons and equipment runs in the range of 10 to 30 percent. This represents enormous waste -- billions of dollars when the overall budget is considered. The cost to the taxpayers of this scrap, rework and remanufacture should be of great concern to everybody in this room. We must be able to convince the public that we can do a better job of getting them their money's worth.

We must also look beyond the problem of product defects to the broader question of how we make sure our modern equipment really works outside the laboratories. One of our biggest concerns at DoD is matching new systems with the logistics needed to support them. Here again, quality is not cheap. Historically, for simple systems such as combat vehicles, initial support requirements like test equipment, spares, and training devices have been as little as 5 - 7% of acquisition costs. On the other hand, support investment for high performance systems, such as tactical aircraft, has been about 20%. As more and more of our equipment fits into this high performance category, the more we are going to have to budget for, and acquire, comparable logistics.

To meet this challenge we have instituted a number of management reforms to make our weapons acquisition process more economical and more efficient. They include more realistic budgeting to avoid cost overruns in the future; planning and budgeting for all the spares and tools that will be needed when a new weapon is put in the hands of troops; enhancing competition among contractors; contracting on a multiyear basis; producing equipment at more economic rates; and improving the stability of our programs so they are done on time and on budget.

Since all our reforms will improve the stability of our defense industries as well as lead to economies for the taxpayer, I am confident that they can lead to better quality products for us -- as long as we work the problem together. For example, our initiatives in multi-year procurement mean we can now make firm commitments for several years of purchases and provide defense contractors with up-front funds to make capital investments. Our expectation is that those investments will be used to rehabilitate the deteriorating machinery in many of our defense plants. Then we can demonstrate to our workers that we really care about the quality of the products we build.

We are not going to get more for less, though I wish we could. But we will have to get more for more, or we will see our resources dry up and the consensus for a stronger defense wither. This is our common responsibility.

Maryland, Virginia, and the District of Columbia have all declared this "Quality Week." I would like to propose that next Monday, when all of you return to your respective corporations, that you inaugurate your own quality campaign. Ultimately the leadership, and the example, must come from management -- not just the quality assurance chief, but everyone starting with the CEO.

Today, I am pleased to announce how we intend to recognize Defense contractors who produce top quality work consistently: The Defense Quality Excellence Award Program. One symbol of this new initiative is the flag you saw displayed in the lobby. The program is voluntary and eligibility criteria have been established by a joint industry and Government study. Award-winning contractors will be presented with a dated plaque and the quality flag which may also be flown at the facility for a period of one year following the award, and contractors will be authorized to include this recognition in their advertisements. Defense contractors who believe they meet high quality standards and are interested in being recognized should contact their local Defense Contract Administration Office for details concerning this important new program. You deserve recognition for a job well done.

So if we all work towards the twin goals of quality and excellence we might end up really getting more for less.

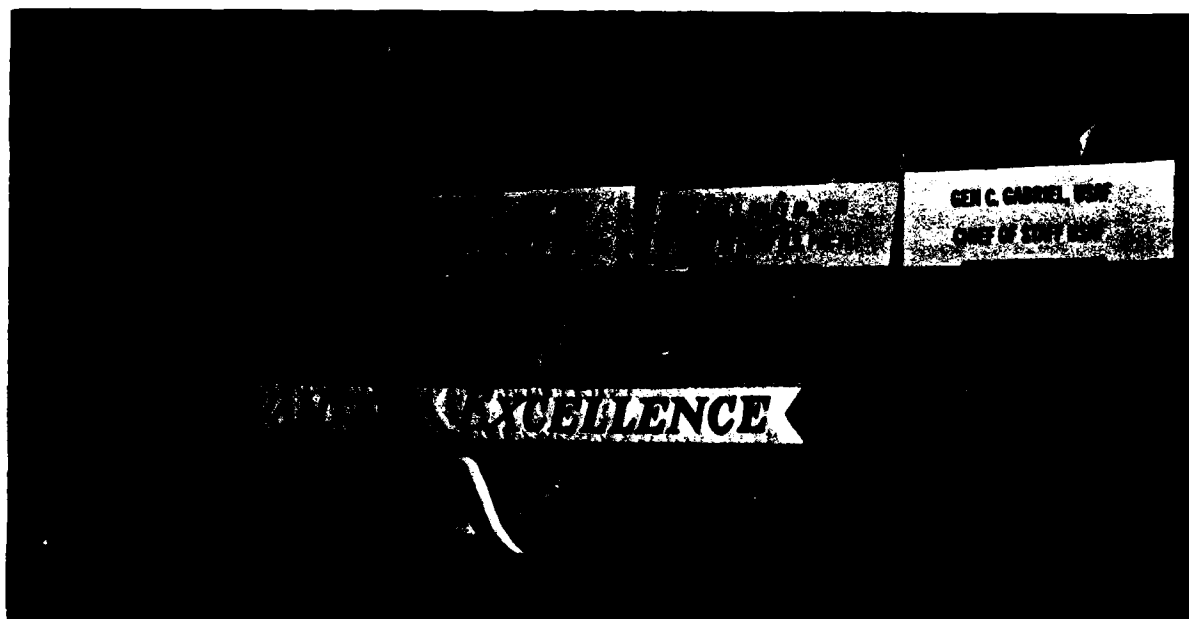
Thank you.



PANEL I

BOTTOM LINE II CONFERENCE

1 JUNE 1983



USERS LOOK AT QUALITY

MODERATOR: GENERAL CHARLES A. GABRIEL, USAF, CHIEF OF STAFF,
U.S. AIR FORCE

MEMBERS: ADMIRAL SYLVESTER R. FOLEY, JR., USN,
COMMANDER-IN-CHIEF, U.S. PACIFIC FLEET
GENERAL P. X. KELLEY, USMC, ASSISTANT COMMANDANT
AND CHIEF OF STAFF, U.S. MARINE CORPS
LIEUTENANT GENERAL ROBERT W. BAZLEY, USAF, VICE
COMMANDER-IN-CHIEF, U.S. AIR FORCES IN EUROPE
GENERAL WILLIAM R. RICHARDSON, USA, COMMANDING
GENERAL, TRAINING AND DOCTRINE COMMAND

QUALITY - THE VITAL LINK

PRESENTATION BY
GENERAL CHARLES A. GABRIEL, USAF

This subject is something that is important to everybody on the panel, everybody in the uniform, and to all of you. The key to our national security is the quality of our forces, the quality of our people and of our equipment. Today we are going to concentrate on the quality of equipment from a user's view and what we think you are doing for us in quality assurance. We'll also discuss what we hope you'll be able to do to assure quality is going to be maintained at high levels, and how you can contribute.

The quality/quantity issue has been flagged in the newspapers very much over the last couple of years. As you know, for a number of years we have been in a situation where we know, if we face the Soviets in battle, we are going to be outnumbered. It's always been said, "they have the quantity, but we have quality. We'll make up for their edge in numbers with our high technology." I think you also know that the quality gap is closing. For whatever reason, it has been decreasing over a number of years. To a large extent it's closing because the Soviets have picked up our technology, either legally or illegally. That's a subject I won't get into, but it is really frustrating to see this loss of technology and not be able to do any more than we have done about it. Certainly, if we can keep our technological lead, we can make it work as we have in the past. But, if we have to go up against our own technology, that will make our job a lot tougher.

As you heard from the threat briefing, the Soviets have been spending twice as much for defense than we have been over the last 10 to 15 years. Lenin once put it this way: He said, "Quantity has a quality of its own." It does. If you are outnumbered to a certain extent, no matter how good your weapons are, you are not going to be able to hack it.

General George Patton once commented on this point about weapons development. Patton said that when Sampson took the fresh jawbone of an ass and slew a thousand men, he probably started such a vogue for this new weapon, particularly among the Philistines, that for years no prudent donkey dared to bray. Certainly, we're looking for a similar silver bullet in the equipment you are building, if any of you should have something like that. In those days, that breakthrough was a jawbone of an ass.

I'd like to define quality before we get started. There are other definitions, but I would say the number one factor is combat effectiveness. Our weapons have to be able to do the job. This is where we part ways with the so-called military reformers on quality versus quantity. It seems the reformers want to finesse the threat. That bugs me a lot because if you can't handle a threat you can't accomplish your mission. It's as simple as that. Combat effectiveness is number 1. The first question is: Is it effective? Can it do the job?

Flexibility, reliability, maintainability - these are all terms you are very familiar with all having to do with quality assurance. Finally, is it affordable? All those factors are what we in the military are having to grapple with today.

You've already been introduced to the panel members. Let me just summarize by saying they all have a deep combat, command, operational, and joint experience. I don't know any better group you could have gotten together to discuss this subject I'll ask each one of them to give us a pitch and then we'll go on to some questions with the time we have left.

PANEL 1 - SUMMARY (GENERAL GABRIEL)

There are many points common among the users:

- . We need the capability now.
- . The closer you get to the threat, the sharper your focus is on the threat and what you need today to do the job. Tomorrow may be too late.
- . Do we risk implementing a system before it is ready?
- . Do we have the best of the state-of-the-art before we field a system? The military would like the best of the state-of-the-art now.
- . We must improve our level of testing.
- . The military needs quality materiel - on time and ready to use.
- . Readiness, maintainability, sustainability must be emphasized.
- . Quality versus Quantity - we can make up some of the quantitative difference with better people and technology. The key to this is tactics, training, and technology.
- . Training is being improved to meet demands of new technology.
- . People are also being better motivated.
- . People win battles, not machines.
- . We need to simplify requirements so industry knows just what the military is asking.
- . We must solve user dissatisfactions during peace time not war time. Let's sort out our requirements now.
- . Industry must give us the strength to meet the enemy.

PRESENTATION BY
ADMIRAL SYLVESTER R. FOLEY, JR., USN

The opportunity to participate in this session today is one that brought me here from Hawaii. You may not hear revelations from each one of us, but the thing that is important, I think, is the fact that we all came here. As all of you in the audience know, and all of us here that saw the threat pitch a couple of minutes ago, it should be aired on prime time TV and shown to everybody in the United States because that's the bottom line for everything that we are talking about here today.

We make a lot of accommodations in the Pacific fleet on a day-to-day basis. The operational readiness of today for the ships is about 77%. That's the highest it's been in my memory. Our squadrons are over 90% combat ready.

I think the reliability of equipment is going to improve in spite of what we do or do not do here today. I think there are several reasons. We have quality people. We can maintain the equipment better. We're paying them better. There are fewer jobs on the outside and we are keeping our military personnel. We've begun to fill up the spare parts lockers and that's important to me.

On a day-to-day basis, we need to be able to get out there and do the job we're called upon; we can't start training on the day of the ball game. As we move closer to a 600-ship Navy, we are going to reap the benefits that accrue from closing the requirements and assets gap. We won't have to work the ships and the aircraft and the planes as hard as we have in the past. We won't have to push the people quite as much if we have enough of these things to go around. So I really think there is a light at the end of the tunnel. Things are going to get better. We're going to improve. We got a good start on it, but there is lots of room for improvement.

One of the ways in which you are going to have to improve is being able to decide what's good enough. You have to reach the point where you cut it off and say that's good enough. Let's produce it now. Let's get on with it. I believe very strongly that we have to maintain our technological supremacy but we also need to learn something from the Soviets. I think it's Gorshkov that has a sign in his office that says, "Better is the enemy of good enough." That's true. Sooner or later you are going to have to start producing them in numbers as you say, "quantity has a quality of its own."

Next, we come to the philosophy of waiting for quantum improvements or hoping for incremental improvements. I think sometimes, too, we have been straining for breakthroughs. We've been making do with what we have while the Soviets have invested in large numbers of good enough systems and are producing follow-on purchases of incrementally modernized variances.

We get success stories within the fleet where our technological edge was worth the sometimes huge investment. But an increasing number of success stories are of those which we have tested in the market and they're designed to accept incremental improvements. The gas turbines in our DD 963 and our FFG 7 class ships have missed no commitments on a WESTPAC (Western Pacific) cruise recently. Redundancy helps, but the systems are inherently reliable and the gas turbines were proven performers in commercial and civilian industry before we got them. Some ships have been delivered with limited capabilities but were designed to expand. The 1052 Class Frigates, the Oliver Perry class, and the Spruance class are examples here.

The F-18 Strike Fighter that is coming out, a multi-capable aircraft, its design features offer quick change out of engines or parts, and considerable access to all systems for quick repair. I personally expect new standards of reliability and combat success from those.

We've got some problem children around, too. I'll just mention a couple of them. The SPS 48 Radar, a key system, has had transmitter reliability problems for over a decade. The Phalanx close-in weapon system that we are putting in our ships now in large numbers, has had premature subsystem failure due to lack of compatibility with the environment. Maybe one of the solutions is to have an intermediate way station or land station where you thoroughly test them out, but in an environment that accurately simulates what they are going to be in when they get out at sea, where it is a harsh environment.

One bottom line is to accept the proven including commercial systems whose reliability has been consumer tested. Another bottom line is proving new technology before it meets the operational requirements in a hot, wet, salty, sand-blown Indian Ocean fleet environment. I know that there is a delicate balance here and we here in the Navy have got to make sure that we don't insist upon introduction of a system before it's ready. Quite clearly, we've been impatient many times. So there is a delicate balance here between making sure it's ready to come out into the fleet and our own insistence in getting it as soon as we can.

I honestly believe that complexity is not the major issue; reliability and maintainability are. We've got to look for systems which do the job, not ones which meet artificial or self-defeating specifications. Clearly, Government specs are too complex. There is no question about that. But then many commercial systems are very complex and they have exceptional reliability. I think that's the factor of the workings of the market place. Customers are not going to continue to buy a piece of equipment that is not reliable, that you can't maintain, complex or not. So we can take our lessons from industry.

Let me summarize a couple things that I have said. We need to put more time into the basic design to eliminate the persistent problems that we can only swat at out there in the fleet. The design of the hardware and the software operation must be simplified so that the systems are not too complex for the

average operator who's far from the company, who is sitting out there in the middle of the Indian Ocean, 45 to 60 days at a time, and his background is fairly limited. Reliable, proven systems and commercial or military way stations along the line that will help to improve our readiness. Systems with room for incremental growth will let us support greater quantities. Clearly, we've got to have numbers. The Falkland Islands incident is a good example. When you see a submarine behind every wave out there you use an inordinate amount of ordnance in the first few days of the war. In every contingency, we've proven that, time and time again. The fleet should not push for systems before they are ready. We will work with you to fix those infant mortality-type of problems. We need a working reliable adult system when it gets in the field. Government specifications, for specifications' sake, don't serve either one of us very well. And, of course, important is the across-the-board quality assurance, and that's from the new parts right through the overhaul and repair cycles. Don't accept substandard performance. Those are just some highlights.

PRESENTATION BY
GENERAL P.X. KELLEY, USMC

For the record, I do have an opening statement for you, Mr. Chairman, if you will allow me to submit that for the record. I do want to make it clear for the record that I did not watch "Blue Thunder" last evening. For 33 years, I've watched only Marine Corps movies. If you want to know about Tyrone Power in the "Flying Leathernecks," or John Wayne in "Sands of Iwo Jima," I can probably give you 15 minutes or so on each.

Looking around, I have two observations. First, if you're really concerned about a guy with a quality problem, take a look, next time he comes in, at poor Mr. Reyes, the photographer from DIA. He is running around taking pictures, and for the next several weeks will be trying to make silk purses out of sows' ears. You've got a problem Mr. Reyes!

I am somewhat intimidated with this very august group. I'm reminded of a speaking engagement several weeks ago. David Chu asked me if I would speak as the DoD speaker to a seminar hosted by Tim Wirth, the Congressman from Colorado. It was advertised as a very low-key informal group. I arrived there at the appointed time. It was in the Cannon Caucus Room, loaded with about 300 people. They were cheering, yelling, clapping, and giving the prior speaker a standing ovation because he was criticizing DoD and how really fouled up we are in the way we manage resources - a fellow named Les Aspin. As I was going on, a young lady thankfully said to me, "General, you do know that at 10:00 (it was then one minute to 10:00) that you are on live cable TV, nationwide."

It doesn't seem possible, Frank, that it's been a year since the last Bottom Line Conference on the same subject. In fact, Gene Grinstead and Frank Collins have informed me that I'm going to keep coming back year after year until I finally get it right. I must admit, however, that I will go to the ends of the earth, there are no bounds for me, to work with you in putting into the hands of our young Marines, soldiers, sailors, or airmen, the best equipment that is available in the world today. So it is not a chore to be here. In fact, it's a distinct honor and a pleasure.

Secretary Thayer highlighted, and I quote from his talk, "Our most precious commodity is people." I want to elaborate a bit on that because I fully recognize, within the context of Bottom Line II, we are talking basically about equipment. It goes without saying that it's the successful marriage of equipment and people that win battles and ultimately wars, as one or the other cannot do it alone. Put another way, I'd like to quote from a great American, a legend of his own time, Admiral Ike Kidd, who said that in the final analysis the battle is won by the young rifleman standing on his final objective and saying, "Here I stand and this I hold and hold by God he will." The bottom line, then, is that it is your job and mine to make sure that we give him all of the equipment, all of the support, that is necessary to get him to that objective, and to get him there alive and whole. That is a big order!

Our secret weapon, of course, is people. I must tell you when you are talking in terms of quality that the quality of people has had a dramatic increase in the last few years. As an example, right now at our recruit training depot in Parris Island, we have a series going through recruit training that has an average GCT of

112. Now, in the Air Force they would probably say that falls in the category of functional illiterates. But for the Marine Corps, that is a record high. It is creating problems, believe it or not. The drill instructor has one hour to give facing movements. He gives left face, right face, about face. They do it in ten minutes, and then he says, "What the hell do I do now?" What we've got to do, of course, is to reevaluate our training. The bottom line is that we do have, right now, quality people. So, we've upheld our end of the bargain, and now it's your turn to uphold the other end, which is quality equipment.

Let me be a bit provocative about technology and equipment. Several years ago, in a panel in Colorado Springs, a distinguished American said, in my seminar, that we shouldn't concern ourselves with force asymmetries of the Soviet Union versus the United States because we were so far ahead in technology. I asked the question at the time, "How do you measure technology? Do you measure it strictly in terms of sophistication or do you measure it in terms of operational capability?" That's a very difficult question; or even more important a difficult answer because I didn't personally care whether the Soviets fired the SS-N-8 missile from a Delta II submarine with a slingshot or with the most sophisticated solid state rocket propellant in the world today. The bottom line was did it go 4,200 miles and did it hit the target at which it was aimed? So I measure technology a bit differently than some.

I still ask the question, "How does one measure technology, in terms of sheer sophistication or in terms of its operational application or utility?" I think that's the question we have to address. Now, don't misunderstand me. That doesn't mean that I'm against technology. Far be it from the truth, I'm very much for it. But I think we have been deficient, we in the uniform, in defining clearly, in unequivocal language, for industry just what our requirements are and just where we are willing to trade off in the face of affordability. We haven't done that very well. But, I think we're doing it a lot better than we have in the past. We'll strive, I promise you, to do it better in the future.

There is one area that the Marine Corps, and I don't believe any Service, will compromise — an area where we're willing to pay the required, and I emphasize the word required, premium quality. Now, I recognize that the cornerstone, if you will, of U.S. industry, is based on the moneyback guarantee. But I have to tell you that moneyback guarantees or the Good Housekeeping Seal of Approval is of damn little comfort to the riflemen on the battlefield when his rifle jams. It's of little consolation to the commander who has a five-year, fifty thousand mile warrantee on the power train of his trucks when a truck breaks down on the way to the front with ammunition that may well be critical to winning the battle. So, quality is essential!

Let me close with a little literary license, if I may. For the breakdown of a tank, we lost the battle, and in losing the battle we lost the war. In losing the war, we lost a country, and in losing a country we denied the basic principles of life, liberty, and the pursuit of happiness to those who will follow. A good friend of mine who was at Desert I, made the following observation. He said, "Machines don't have hearts, and they don't have souls, and they are not very patriotic. They don't care whether they are going to Timbuctoo or Tehran. When they quit, they quit." Well, let me say that machines are built by people. And when those people are from American industry, they do have hearts, and they do have souls and, they are very patriotic. If our machines are built by people who care, then they'll never quit. So, gentlemen, the ball is in your court. Thank you!

PRESENTATION BY
LIEUTENANT GENERAL ROBERT W. BAZLEY, USAF

All of my prepared remarks have been covered with great expertise and great detail by the Deputy Secretary of Defense, my own Chief and Acting Chairman of the JCS, and, of course, Admiral Foley and General Kelley covered many of the key points. So if you will bear with that preface, I'll just try to fill in a couple other things that perhaps have not been discussed.

In my current command in Europe, like the other Services' combat commands, our bottom line is readiness with sustainability. As mentioned by about everyone, that is a combination of two things: the quality of people and the quality of the weapon systems and the support equipment. I'm delighted to report, as I look back, that we've made some great progress that we can be very proud of -- we as a nation, we as Services, and the usually misunderstood, misquoted, often maligned thing called the military-industrial complex. I've never had the pleasure of being part of or making any contributions in the R&D or acquisition procurement business. But as an almost constant user, I have to question the malignment of that mystical thing called the military-industrial complex and come in from another viewpoint, 180° out of phase of the criticism from my view, as a user over these many years. I say God bless that "complex" and praise all of you who have had an active and important part in our successful progress in the area of quality systems and equipment.

Being on the European scene is close proximity to the threat of the Soviet Union and the Warsaw Pact makes us keenly interested in that threat and again of the quality of both people and equipment. By mission, USAFE is essentially a tactical force in Europe. Our interests are much broader than that because we are dependent on strategic systems as well as in the form of strategic airlift, air refueling, reconnaissance and communications. So our interest in quality of hardware and equipment is very broad. As we look back over our own history as compared to the threat and the progress of that threat, I think we can do it with some prideful comfort but certainly not with complacency. We have made giant strides in the areas of maintainability, reliability, and supportability. I think part of that great success was in the design phase of military equipment and weapon systems, in that period as we conceived the ideas and started putting them to paper before production. Over the years we've learned to put emphasis on these factors of reliability and maintainability on an equal level with performance and combat capability and in my view it appears to have had a great payoff.

Now some examples from the user's viewpoint of those kinds of successes to help set the scene of current events for today's conference: The F-15 Eagle, for example, our superb air superiority fighter, enjoys the lowest accident rate of any U.S. fighter aircraft we've ever flown operationally. We have some advocates who want to put us back in the "beautiful" P-15 Mustang stating: it is simple and easy to operate. But as we compare that critical

measurement of aircraft mishaps -- and I'm talking about major accidents and I'm talking about loss of life of very expensive and hard to train aviators as well as very expensive weapon systems -- the cost of the weapon system really doesn't matter very much to a young pilot who is involved in a major aircraft accident. It's sort of an academic issue and we need to keep sight of that. But as compared to that beautiful airplane called the P-51 Mustang of World War II, the mishap rate, the accident rate of the F-15 is something on the order of 1/20th of the accident rate we had with the P-51. Now those of you who are knowledgeable recognized that there is more than quality in material or equipment involved. There are things such as advances in training that institutionally we've made over many years, advances in things like standardization, and just hard-nosed flying military discipline, which have made a contribution to improved flying safety. But certainly design and quality of material is a definite and large factor in the great success of the F-15 in the area of aircraft accidents. Compare the simple and "beautiful" F-86 of the Korean War vintage to our new F-15 and discover that the mishap rate is only 1/5th of the F-86 Saberjet of the 1950s.

Taking a look at tactical aircraft capability now and in the past is another segment that is very important to the user. I remind the audience that with our World War II and Korean tactical aircraft we were able to garner about two sorties per week out of each individual aircraft - two sorties per week. In recent realistic exercises, with our modern tactical fighters, we routinely fly better than three sorties per day versus that two sorties per week in those "beautiful simple" airplanes of the 1940s and 50s. And we do that, three sorties or more per day, for significant surge periods. For extended simulated combat operations, we average better than one sortie per day, per day, not per week, for those new aircraft. Probably most importantly, and Secretary Thayer described it a little bit as he described the Schweinfurt raid back in World War II, with these new airplanes, we get a lot of bombs and missiles "on" the target and not so many "around" the target. The example he used, the massive air armada required to take out a ball-bearing plant in Schweinfurt, the second Schweinfurt raid of World War II as he described 291 airplanes, and with a B-17 that comes down to about 3,000 airman who we jeopardized against strong defenses to take out the industrial capability of the Germans. Three thousand airman airborne and, as he pointed out, we lost 60 of those B-17s in that raid which came down to about 600 human beings like you and me who never returned from that day of the war. With the advanced systems that you've given us, the military-industrial complex has given us, like the F-16, analysts tell us that six to eight F-16s -- single place, small, very capable, very accurate systems -- six to eight of these airplanes could probably do a better job than those 291 B-17s of World War II. I don't know how we would describe success in quality more dramatically.

More recent comparisons down to the nitty gritty of day-to-day maintenance operations, our F-4 Phantom Jets require twice the number of corrective maintenance actions per flying hour compared to today's F-15s and F-16s. That means our crew chiefs are out there working on those airplanes a lot more than on our more modern airplanes. We talk again about quality which has impact on our spares and our War Reserve Materiel (WRM). The frustrations resulting

from misprojection of mean time between failure rates and thereby how much stockage we need on parts and spares as we try to motivate our dedicated people to keep the airplanes flying is damaging to morale of even top quality people. The crew chief, the line supervisor, is frustrated as he goes to supply and he can't find the "O" ring seal that he needs because we didn't forecast requirements accurately. Poor quality coupled with poor estimates results in cannibalization, overtime, wasted effort, and morale problems.

So with some of those specific examples, I think we can all take some pride and have some comfort, but again not complacency. In the fighter business, for example, we know in a typical fashion the Soviets have developed a copycat F-15 and F-18 aircraft. We know they are about to go into production. So we can't afford to be complacent and rest on our laurels. Our new systems are good and the laurels are justified, but the need, the requirement, the challenge are still there and will remain there. Many of the people in this room will be the ones to determine whether we're successful in keeping ahead on that qualitative edge and I think you really and truly understand the importance of that quality to those of us in the field.

It's good to be with you.

PRESENTATION BY
GENERAL WILLIAM R. RICHARDSON, USA

I'm delighted to be here to talk to this distinguished group of representatives of Government and industry about these important subjects. Our job in the Training and Doctrine Command is to represent the user's point of view for the troops in the field and I want to talk to you about material quality and Army readiness.

First, this is what we do in TRADOC. We are responsible for writing doctrine. That is, how the Army fights and how it is to be supported to fight. In the Combat Development arena, we determine the Army's requirements for materiel and organizations to fight, and then we train the Army to fight and win. Let me describe to you the materiel process we follow in the Army.

We start with a concept. That concept is based on a need, a particular battlefield task. Then we break that down into mission areas. We analyze those mission areas by the specific functions of land combat and we determine what deficiencies we must correct to improve the battlefield capability. Requirements are generated in four areas. The one that you're interested in is materiel: From that, we develop solutions. The solutions take the form of requirements documents, written by various service schools, sent through the Department of the Army, to the Development and Readiness Command (DARCOM), for approval and funding. When they are funded, DARCOM contracts with industry and brings along the equipment. We modernize the forces, the forces are improved, then we begin the cycle again for a new concept. So there is logic in what we are attempting to do in bringing our requirements into being.

What is the meaning of quality as far as the user is concerned? First and foremost, he wants the equipment on time and he wants it to work. Here are some points that you might keep in mind. He wants it to meet specific performance requirements. The requirement must be very specific so we understand what it means and yet we don't want to go beyond certain limits so that it takes an inordinate amount of time to get it into the field. The user insists that it be reliable, available, maintainable, and safe. He wants it compact and lightweight. He doesn't want to incur a burden traveling around the battlefield with something he can't use because it's too heavy or because he can't transport it tactically or strategically and, therefore, can't get it to the battlefield at the time he wants it. He does not want to be burdened with a heavy support tail. And he does want it on time to be used effectively. Otherwise, we're going to be outpaced by the enemy and he is going to have an advantage on us in terms of having an item of equipment that is better than ours. Also, the user wants a full logistics support package. That means he wants the spare parts, the tools and test equipment, and the maintenance documents and manuals so he understands how to maintain the equipment. He wants the training support package and necessary training devices or simulators that go with the equipment.

Let me give you an example of some things that the user has been dissatisfied with: The M551, commonly known as the Sheridan, came out in the Vietnam War, was quickly fielded, but had a deficient main armament design. It was the incompatibility of a high recoil gun with a very sensitive Infra-red missile guidance system all in one tube. That system was later put on a M60 tank chassis and called that the M60A2. The M60A2 was fielded in Europe starting in 1975, a total of six battalions. Besides the poor gun design, we had a problem in repair parts. By 1979, we were having difficulty in getting our units to the field for gunnery practice. One battalion, for example, had to put in 143 armament fire control job orders costing about 486 thousand dollars in order to get to gunnery practice and when they got through, 33 of the 54 tanks were unservicable and we had to spend another 155 thousand dollars on repair parts just to bring them back up on-line. Now, you can do a certain amount of that in peace time. You cut back on your training requirements, but you can't afford that in wartime. So, we were very unimpressed with this weapon system and subsequently phased it out in 1980 because it had a low readiness posture. It really was a poor morale factor for the troops because they said we can't take on the T64 with the M60A2; so we phased it out of the system in 1980.

As another example, during the Korean War we fielded 3.5 inch rocket launchers - very effective in those days as a man-portable anti-tank weapon system. But, it had a short range, so in the 60s we decided to replace it. We did that with a light anti-tank weapon system, the LAW. The LAW then became ineffective due to advances in Soviet armor and we decided in 1975 to replace that with the VIPER. There were design problems, technical failures, and Congress refused to fund procurement in 1983. Congress would, however, provide test funding on a competitive basis with foreign manufacturers as well as other U.S. items for comparison. What does this mean? We still don't have a fielded system and we have a deficiency in the short range battle against Soviet tanks.

There is one other example in the same functional area: The DRAGON, a man-portable medium anti-tank system on which we have had difficulty training people. The user really doesn't like it. Here are some of the reasons: It's inaccurate, takes a lot of training time, and has poor soldier-machine interface. This weapon is usually fired from the sitting position. Psychologically one doesn't want to sit on his butt facing the enemy and have no way to immediately get to ground, so it's a highly undesirable type of weapon system. We are trying to get it replaced with the RATTLER. That will probably be discontinued because it appears to be too expensive. So, we are lacking soldier confidence at the same time we are degrading our combat effectiveness.

Just a few other examples: The M114 command and reconnaissance vehicle - we had problems with that. The Division Level Data Entry Device - we had great difficulty with this one. Here we had a contractor that we had to terminate because he was incompetent. Couldn't put an automated logistic system out to the user. And of course, we've got battle dress uniforms that shrank, kind of a gig on all of us here in the materiel development business.

What does this mean? Troops really get down on the system. They say, "What's the matter with you guys back at the Pentagon or elsewhere who are supposed to be in charge of equipment for us?" We don't like that, nor should our leadership accept that. We ought to be working together toward trying to give the troops something they can use.

What can we do about it? Here are some thoughts. We've been defining our requirements improperly at TRADOC. We have started to correct that. A couple of years ago our requirement documents were very voluminous. We have now said they will only be five pages, so you get very specific and precise. We must stop changing those requirements because that makes it very difficult for industry to react to the changes. This results in greater cost and it delays system fielding. Thus we begin to lose confidence that we were right in the first place. That is something that we and the DARCOM community must watch very carefully.

All of us have got to work that long materiel acquisition process. It's something the user can't stand. He doesn't like to talk about five or ten years away. He observes what the Soviets have and he wants that for himself. He is asking us in the materiel community to get this out sooner. There are ways around that. I think there are ways around any part of the bureaucracy in order to try to find methods to react more quickly. We are doing some of that out in the Ninth Division with the Army Development and Employment Activity. Letting the user identify a quick reaction program or process. Send a requirement in to our system, in to DARCOM, in to the Pentagon; get some funding, get it to us via the Congress. Let's put it out in the field and go with it. We've got to find some better ways. The user keeps on beating up on us with this one. We need to take a look at whether we're pressing the state-of-the-art all the way to the detriment of getting the equipment out. Perhaps it is sufficient to get 85 or 90 percent of potential capability. Did we do enough testing? Probably didn't to the M551, but in many instances, maybe we do too much testing. Maybe we are testing because we are not sure what the outcome might be. In fact, we ought to have a good idea what that outcome would be. We've looked at testing in the operation and development side time and time again. But you can find, I think, in many instances that this is an area where we can make some improvements.

Integrated system support is the key to successful materiel fielding. The user wants that test and diagnostic equipment out there at the time he gets the major item. He wants the materiel to be described in the proper manuals: how to maintain it, how to operate it, how to fight it. Part of that is our responsibility, part of it is DARCOM's responsibility, part of it is industry's responsibility.

We think that in many cases there has been lack of industry attention to the agreements that we've had in contracts. Either we are asking more than you can possibly deliver or maybe you're asking more than the Government can afford. But, there has got to be some dialogue so that we can insure that those contractual agreements are met. Then we have other elements - OSD and

Congress. At times they may be cutting, stretching out programs, or stopping them. I won't say for capricious reasons, but perhaps for their own parochial reasons.

Finally, I would say all of us have got to manage better. We in the Army, OSD, and you folks in industry. I think we've got to speed up the process. The user keeps asking us to do that. We've got to find the work-arounds. We've got to fully fund programs. We've got to say: "This is the system, put it in priority, fund it, and bring it on out." Economically, we think that is right. Furthermore, you get the amount of equipment in the field at the time it is needed.

We ought to learn to accept some risk. Many may question whether the system is ready. We, industry and the Army, are very good at taking something and making adjustments as we take those first production items into test, into the units, and bring them on to the field. Bottom Line simply means we've got to put our thinking caps on to find ways to do things better and then have some solid planning behind it. Not just a hip-shoot from our standpoint, but very logical milestone planning in terms of where we want to go and how we want to do it with you. And then we need to get on with it.

Thank you.

PANEL 1 DISCUSSION

Question: (Weiss) How can industry convince the media and the public that quality doesn't cost and sophistication of weapons doesn't mean less quality? How can we get responsible support from the media?

Answer: (Foley) We must take advantage of every speaking opportunity for articulate spokesman, like General P.X. Kelley, who have credibility and are convincing to an audience. I know most of the people here do a lot of public speaking and spend a lot of time in front of the media. I think some success is being shown these days, but it is a gradual process.

Answer: (Gabriel) It is a very frustrating thing to get a handle on, especially when we see in the press that we should go back to the simple versus the sophisticated. Talking about the effectiveness of today's weapon systems, last year one of our most sophisticated fighter aircrafts had nearly 70% full operational-ready capability, the best readiness rate of our fighters across-the-board. Stories like that don't come across and we would appreciate any ideas you might have. The best publicity we have had for such systems is the air war over Lebanon against some of the best equipment the Russians have. We have not done a good job in enlisting the support of the media in telling the story in a balanced way.

Question: (Bachman) General Richardson expressed concern with the lateness of the acquisition process. Perhaps because we do too much development and operational testing and Admiral Foley thinks we should improve our design before we get into operation. I think we in industry believe we need a more up-front attention to problems. How do we reconcile the apparent differences to satisfy your requirements and ours?

Answer: (Richardson) One of the things that I think we can do is for the user to have a greater interaction with you at the corporate level to give you some ideas of those areas of deficiencies that we want you to give some attention to, and for you to have a fairly good assurance that we are going to continue with the program and not discontinue it in a few years. We are beginning to take some steps to make that happen. Another thing is, we've got to be consistent even though we change command and personalities in our system. We've got to hold a very hard line on that and proceed with giving you high assurance that that is really what we want in that product.

Answer: (Kelley) Let me attack the same subject from a different perspective. There is no doubt in my mind, having delt with Bottom Line I and now Bottom Line II, that everyone in this audience wants to see quality in all military hardware and I'm sure when you go back to the corporate offices, that is the message you'll put out. In my opinion, one of the failures takes place on the assembly line because of the lack of motivation, in many cases, of people. Let me give you an example: I was privileged to lay the keel on a Landing Ship Dock (LSD) at one of our shipyards, and the president of the company used my time very profitably by taking me around to talk to the hard-hats, down where the rubber hits the road; where they are bending metal, and to me, that is

essential. I now, every month, get a letter from the president of that company with a new picture that tells me precisely how the ship is progressing - what's going on, and I, in turn, write a letter back to my friends, the hard-hats, and tell them how the Corps appreciates all the good work they are doing. What I'm saying is it's a two-way street, gentlemen - use us. When we visit you, don't stick us in the corporate office with a big fancy lunch. Get us out on the line so we can talk to the worker and see how you are doing it. And believe me, I think in this one way, you'll get some significant benefits. So, it's approaching the same problem from a little different perspective.

Question: (McCarter) I was very interested in several of your comments about reducing requirements; that is, making them more precise, more accurate, and not changing them after we get started developing a weapon system. Does this mean that we are going to have a larger reference list? In other words, how do you get 1 1/2 inches into your five pages that you were going to come up with?

Answer: (Richardson) One of the things we envision is that we in the requirement side of the house write generically what we want a product to do in an operational context. We would look for our companion in the process, DARCOM, to then put out on the street a Request for Proposal (RFP) which gives you a definition so you can come in with a proposal. What we have attempted early on is to be too precise. That does not give DARCOM the opportunity to write the RFP that would enable you to come up with several different approaches. Some people have made the argument, "Why don't you be precise - there are three ways to use an attack system. Why don't you select one?" That is attractive in a way that we can then prescribe it to that arena, but we may deny the opportunity to look at three different solutions. So we think that we ought to be fairly generic.

Let DARCOM come to you and then you apply the best technology, and it may compete with industry to meet that need. That's the way we see it happening. That will mean that we will be quicker on the street to DARCOM with a requirement document. Then it is up to them to get it to you.

Question: (Seaberg) Several members of the panel talked about specifications being too aggressive and the sophistication versus meeting operational requirements and the users were doing something about that. My question to the panel is: Do you have suggestions or recommendations to industry as to what they might do to help you solve that problem?

Answer: (Richardson) In the electronics area, the time span of technology changes so rapidly that when we begin a product, we ought to go ahead and decide with you that's it, lock and proceed, knowing that you could go to product improvement later rather than possibly changing it in the two or three years you are in engineering development. I think that we have a tendency to constantly change knowing that a year from now it's going to be a little better process. I would maybe criticize ourselves, OSD, and even Congress for saying, "Well, why don't you wait a year because we know technology is coming along; therefore, just hold up on this because there is a better system coming down the road." We think that is an inappropriate way to go and what we prefer to do is lock on it and proceed, and then go to product improvement as you proceed.

Answer: (Bazley) Looking at that question from a user viewpoint, we've made some tremendous improvements in the reliability of our current weapon systems in the field. When we get to sophisticated weapon systems, I think General Kelley said it well, "sophisticated technology should not mean complicated, it should mean operational combat capability." I think that is the direction we have gone with some side digression. Being complicated doesn't surprise our people in the field, the group with their hands on the wrenches in the avionics shops. It may take some work arounds and some follow-on Time Compliance Technical Orders (TCTOs) to make it but that's an important part of the military and industrial contribution to the quality of the military system. It's more than the design and production - it's the follow up and one step further, I would turn to the top elements of industry: Don't lose sight of the fact that your name is on the equipment. We've grounded a whole fleet of airplanes because some sub-subcontractor took a shortcut on a specification.

Answer: (Foley) You in that sophisticated world out there have a lot of products turning over all the time. To those of us far removed from the flag pole in Washington, we are not aware of what is precisely going on out there. This is a very complex and dynamic environment in which you live. One of the things the Navy, and I think the other Military Services, must do is leave our people in place longer and not turn them over every two years. We need to put our people in systems command to interface with you and leave them there so they really understand industry, the systems, what is available, and become experts in their field. I think that we see changes in that direction, possibly from both sides.

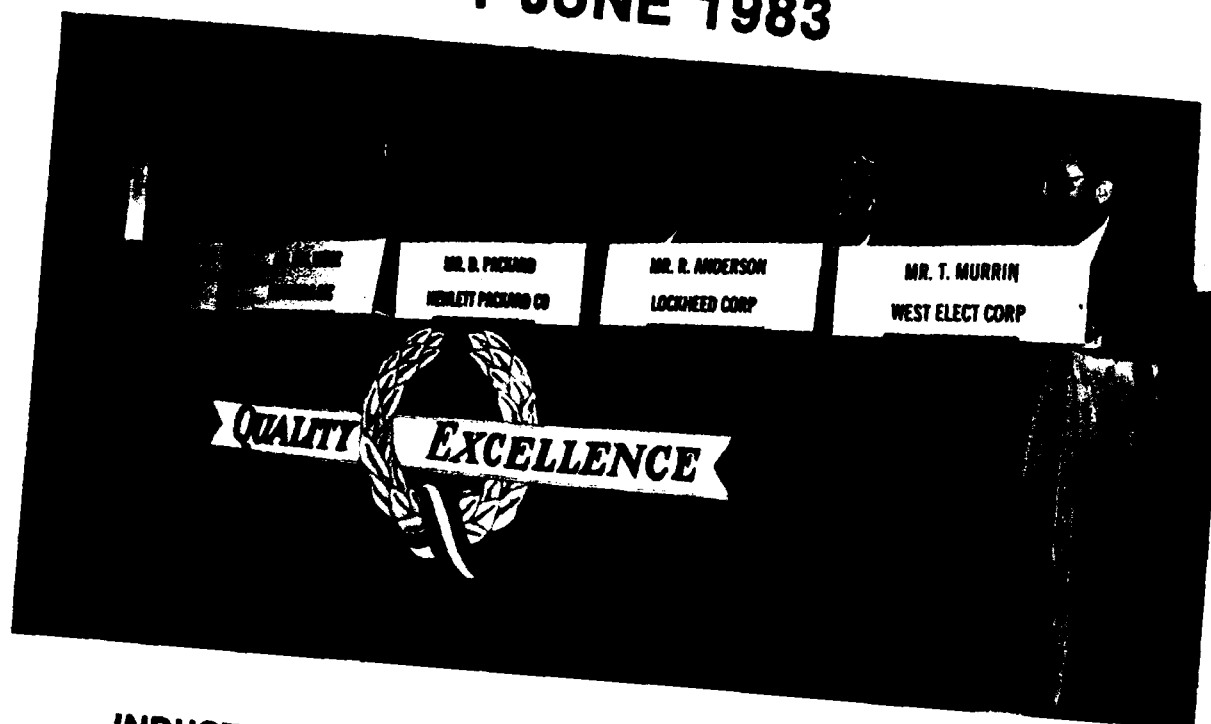
Answer: (Gabriel) Could I add just two things: The Air Force has done baselining and the B1 is a good example of that where we put together with the exact description of the program and the costs. On the F15 and F16, we've met the improvement together in a package we call Multi-Stage Improvement Program (MSIP); and that's a good way to handle follow-on improvements. By putting it all together in one program you can better sell these improvements to Congress.



PANEL II

BOTTOM LINE II CONFERENCE

1 JUNE 1983



INDUSTRY LOOKS AT DEFENSE CONTRACTING AND ITS IMPACT ON QUALITY

MODERATOR: MR. THOMAS J. MURRIN, PRESIDENT, ENERGY AND ADVANCED TECHNOLOGY GROUP, WESTINGHOUSE ELECTRIC CORPORATION

MEMBERS: MR. ROY ANDERSON, CHAIRMAN OF THE BOARD AND CHIEF EXECUTIVE OFFICER, LOCKHEED CORPORATION

MR. DAVID PACKARD, CHAIRMAN OF THE BOARD, HEWLETT-PACKARD COMPANY

MR. WILLIAM J. WEISZ, VICE CHAIRMAN OF THE BOARD AND CHIEF OPERATING OFFICER, MOTOROLA, INCORPORATED

MR. WILLIAM E. HAGGETT, PRESIDENT AND CHIEF OPERATING OFFICER, BATH IRON WORKS, INCORPORATED

QUALITY - THE VITAL LINK

PRESENTATION BY
THOMAS J. MURRIN
WESTINGHOUSE ELECTRIC CORP

Good Morning, Ladies and Gentlemen. I am delighted and privileged for the opportunity to be with you today and to be moderator of this distinguished panel.

With me today are Roy Anderson, Chairman of the Board and Chief Executive Officer of Lockheed Corporation; David Packard, Chairman of the Board of Hewlett-Packard Company; William J. Weisz, Vice-Chairman of the Board and Chief Operating Officer of Motorola, and William E. Haggett, President and Chief Operating Officer of Bath Iron Works.

You will be hearing from each of these four gentlemen individually, and then at the conclusion of our remarks, we will then open the floor for discussion and any questions or comments that you may have for any of us.

Let me start by taking a few minutes to share informally four simple, but significant insights derived largely from our studies and efforts at Westinghouse---particularly during the past four years---to improve Quality and Productivity.

1. To help assure our National Security---and our International Competitiveness---Quality Improvement must be given top priority along with People and Technology. Frankly, we started out with Technology and People and then added Quality. Today, we at Westinghouse have a Quality Improvement Program. It is heartening that this conference is so committed.

2. To accomplish significant Quality Improvement, it is necessary that the Top Executives of the involved organizations get personally-and-professionally involved---in addition to being committed and supportive. Happily, the participants in this panel and in the conference, indicate that this is happening. For example, on a personal note, this year I have spent three full days in three of our business units participating in what Dr. Juran calls Management Audits.

3. To achieve real Quality Improvement in Defense requires a close, cooperative relationship between the involved people and organizations. Much of this is underway---and is characteristic of much of what we, in our Nation's "Arsenal of Democracy" do together---but many more contracting improvements and innovations are achievable; and must be forthcoming.

4. Finally, Quality Improvement is an extraordinary Win-Win opportunity---resulting, if successfully managed, in

- *Reduced costs and Improved Productivity
- *Improved Personnel Morale
- *Greatly increased customer and user satisfaction, and
- *Improved volume and profitability

Improving Quality is a truly great opportunity for us as individuals, for our organizations, and for our country.

And now, most importantly, to our Industry Executives.

So, I would like to turn the microphone over to Roy Anderson. Roy was elected chairman and Chief Executive Officer of Lockheed Corporation in September 1977, after having served as vice-chairman of the board and chief financial and administrative officer since 1975.

Roy joined Lockheed in 1956 as a staff accountant. A native Californian, he has a bachelor's degree in economics and accounting, and a master's degree in business administration from Stanford University. He served as a Naval Officer in both World War II and the Korean conflict.

Among his many community activities, he is director of the Los Angeles Chamber of Commerce and director of the Los Angeles World Affairs Council.

(Anderson gives his comments)

Our next panelist, Dave Packard, has served as chairman of the board of Hewlett-Packard since 1972. Dave co-founded this very successful company in 1939—and served as chairman of the board and Chief Executive Officer until 1968 at which time he resigned his chairmanship to serve our nation for three years as Deputy Secretary of Defense under Secretary Melvin Laird.

Born in Pueblo, Colorado, Dave is also a graduate of Stanford University, from which he holds two degrees: a bachelor of arts and a degree in electrical engineering.

He is the recipient of a host of awards—including the 1972 James Forrestal Award.

(Packard Speaks)

William J. Weisz, who is our next speaker, has been Chief Operating Officer of Motorola since 1972 and vice-chairman of the board since 1980.

Bill began his career with Motorola as a junior development engineer in 1948, after receiving his bachelor's degree in electrical engineering from the Massachusetts Institute of Technology and after service with the U.S. Navy.

Among his first assignments was work on early versions of the company's Handie Talkie FM Radiophone.

Bill has been very active in the Electronic Industries Association, and in 1981 he was presented the association's highest personal recognition, the Medal of Honor, for his outstanding contributions to the advancement of the electronics industry.

(Weisz talks)

Our final speaker is William E. Haggett, who has been President and Chief Operating Officer of Bath Iron Works Corporation since January 1981.

A native of Maine, Bill received his bachelor's degree from Colby College and then later attended the Middle Management Program at Harvard Graduate School of Business Administration. Bill served as an officer in the U.S. Air Force and has lectured at the Naval War College and throughout the United States as an advocate for a stronger United States Navy and Merchant Marine force.

(Haggett speaks)

Thank you gentlemen for your excellent presentations. At this point, I would like to open the floor for discussion.

PRESENTATION BY
ROY A. ANDERSON
LOCKHEED CORPORATION

In the last decade or so, U.S. industry, labor and government became alarmingly aware that we were losing our competitive edge to foreign competition in some very basic industries.

Three reasons stand out for that adverse trend:

1. We weren't being as innovative in determining what the customer wanted.
2. We were losing out on cost competitiveness -- our rate of productivity growth became flat.
3. The trademark "Made in the U.S.A." didn't mean nearly as much -- our product quality and reliability had slipped.

Can we recover? There is no doubt in my mind that we can. We've all learned a lot in recent years. The important thing is we're focusing on the problem.

There are several key factors which are essential to reestablishing our traditional U.S. supremacy in two of the three areas, which two areas are germane to this conference: product reliability - cost competitiveness. The key factors pertain equally to defense or nondefense business. Mention will not be made of factors which are inherent in systemized functional areas such as engineering, production planning, production, quality assurance, facilities, etc. All the latter are obviously important, but it is assumed they are in place.

The key factors are:

1. There must be a clearly expressed, unshakable long-term commitment on the part of top management to product reliability and cost competitiveness.
2. That top management commitment to quality of product must be communicated to all employees. They need to be fully motivated to achieve the objective of excellence. Employees need to know the company's plans, objectives and goals. They need to know results. They need to hear it directly from top management in a personal way. They need to feel a real sense of belonging to a team -- a team dedicated excellence. And the American worker will respond! They like to be winners!
3. There must be a strong commitment to support the product and the customer once the product is delivered. Performance in the field establishes the real quality and reliability of the product. There is an absolute need to be close to the users so that deficiencies of whatever nature are brought to the fore for prompt corrective action. These deficiencies can relate to design, manufacturing, packaging, manuals, training, and spares supply.

4. The type or method of contracting between the DoD organizations and the contractor plays a vital role in determining the quality and reliability of the hardware purchased. The contract carries a message as to what is most important to the purchasing agency. If the major incentive provisions are based upon performance to specifications and continued performance over a period of time and under specified environments -- then it is very clear that product quality and reliability are of prime importance to the customer. Contracts where the major incentives -- or the only incentives -- are on cost or delivery schedule may convey the impression that quality and reliability are of secondary importance to cost or schedule. The defense industry and government must work together to expand the use of performance incentives and to avoid cost and schedule as dominant contractual incentives except in those rare cases where cost or schedule really are of overriding importance.

5. We should jointly push for expansion in use of multi-year procurements. Program stability is one of the most important factors in both improving product quality and reliability and in improving productivity. Abrupt changes in production levels can and usually do severely impact both product quality and program costs. Shutting down a production line and then restarting it after even a short period of time causes a severe loss of learning as most of the reassigned or surplused people do not return to their previous jobs. Those that do return may be understandably wary and are likely to be looking for a more stable job.

Multi-year contracting can result in much improved production stability through avoidance of extreme production peaks and valleys. Personnel replacements can be planned and orderly with adequate time for training and familiarization. "Learning Curve" improvements continue in effect and productivity improves.

While it has been more difficult to actually complete multi-year defense contracts than many of us believed would be the case, progress is being made. As their use is extended, the favorable productivity and quality impacts will become more apparent.

To repeat, we need to jointly push hard for expanded use of multi-year procurements where the program is adaptable thereto and real savings can be realized. Congress must be convinced that the benefits far outweigh their stated concerns in the current budget climate.

To conclude, defense contractors do recognize the increased DoD emphasis both upon improved operational quality and reliability and upon lowered product costs. The above five factors are important to achieving those objectives.

PRESENTATION BY
DAVE PACKARD
HEWLETT PACKARD COMPANY

Ladies and Gentlemen, I am pleased to be here again. It was just fourteen years ago that I took on the job of trying to help out at the Secretary's Office and I notice that there are still a lot of the same questions and same problems that you're talking about today that we were talking about at that time, but I am also encouraged to see that there has been some improvement in performance along the line. I was pleased to hear about the F15 and F16 because those were a couple of programs I got started and I'm glad to know they turned out alright. Sometime last year, Fortune magazine conducted a survey among 6000 business leaders asking them to rate various aspects; e.g., innovative contributions, financial performance and so forth. Among those qualities that they were asked to rate was the quality of their products, and the companies that came out on top in that rating were the Boeing Airplane Company, the Caterpillar Tractor Company and Hewlett Packard Company. I would like to note that I am on the board of all three of those companies. Now, I don't imply that there is any cause and effect relationship except perhaps in the case of the Hewlett Packard Company but I do know a good deal about the management policies of these three companies and I thought it might be interesting to outline some of those because they have some things in common and some of the things that they are doing I think are very relevant to the subject we're talking about here today. In the first place, everyone of these three companies has a very strong commitment to quality that starts with the Chief Executive Officer and goes through the ranks of the company to the lowest level. And we've tried to develop that attitude in our company since it was founded some forty years ago. It is indeed a commitment of everybody in the company to performance and quality. Now I think it's important to realize that quality is not only reliability. Probably the best definition of quality is your ability to satisfy your customer because he's the final determinate of whether or not you're doing a good job: I don't agree that a money back guarantee has anything to do with quality. If you're relying on a money back guarantee and nothing else, you're likely to run out of money. That's not the way to do it. It is a commitment to build the best product and, as we've put it in our company, for those products to serve our customers well for as long as our customers need that product. I think all those companies have that commitment.

The second thing that's characteristic of these three companies is that each has a very long experience in their specific area of business. The Boeing Airplane Company was rated high in this case, I think, largely because of their commercial airplane although they are also a very important defense contractor. On that point I do not want to imply that they are not equally capable defense contractors but, as was indicated by several people earlier, defense contractors sometimes do not get as good a rating in the media as the media as the nondefense people do. But in the case of the Caterpillar Tractor Company, they have concentrated on heavy earth moving equipment for many, many

years. In the case of the Boeing Aircraft Company, as you know, they have a long history in commercial aircraft and in more recent years starting with the 707, the 747, the 727, the 737 and now the 757, the 767 - a long continuity of experience in this field and I mention this because it's really not possible, in my view, to do a top quality job without having a lot of experience. Nobody is smart enough to write down all the rules of design and building of a new quality product. You just have to learn a lot of these things by experience, and by concentrating in a particular field over a long period of time you are able to learn more and do a better job in terms of achieving quality.

Another characteristic that all of these companies have is a strong commitment to operational testing. Now in the case of the Boeing Airplane Company this comes about of course because there are extensive requirements by the FAA to do operational testing on new commercial aircraft before they're put in service and this is indeed done in a very thorough manner. As far as the Caterpillar Tractor Company is concerned, they have an extensive proving ground and they quite often will operate their equipment for a period as long as two years under actual operating conditions loading rock with their loaders, hauling it with their trucks and under conditions that are exactly like those that will be encountered by the customers in the future. They also do testing in their development on the strength of their various parts of their new designs and so forth. They do this during the development period but also after the design is completed and in production, and the new product is made with production tooling. Then there is a very extensive period of operational testing and they quite often discover problems that must be corrected before the product is put on the market.

We've tried to have a similar program in our company. We've had a very fortunate circumstance in that in the Hewlett Packard Company, in its first two decades, we concentrated on general purpose electronic measuring instruments. We were all electronic engineers and we were very knowledgeable about what kind of new measuring instruments an electronic engineer needed to have. We called this the "next bench syndrome." If the development engineer could satisfy the fellow on the next bench about the new product he was developing, that was a pretty good indication that it was going to be a good product for a customer. So we had kind of a built-in operational testing situation in our company. When we got into medical instruments, we did not have that capability but we were able to develop a strong liaison with medical schools and hospitals, and we continued that process in our medical products to make sure that we had an exposure to operating conditions before the products were put on the market. Here is a case where it's a life and death situation as far as the reliability is concerned.

One of the things which I think is extremely important is this question that has been mentioned here already and that's the close relationship between the contractor and the customer. I think this relationship has to begin very early in the development stage. Here again I don't think anybody is smart enough to set down detailed specifications for a new product. This must be an iterative process and it should include close consultation with the customer from the very beginning of the design. In the case of these three companies that I've mentioned, the Boeing Aircraft Company does this extensively. They

work very closely with their potential customers. From the beginning of a design of a new aircraft that design progresses to make sure that it will meet the needs of the customer. This is a feedback process that is extremely important. Caterpillar Tractor Company has a worldwide network of dealers that provide a very close coupling between the customer and the factories and the design groups and they bring these dealers back in on a continuing basis and they work with the new-product engineers to make sure that these new designs are directed and modified to meet the actual requirements of the user. Now we've done that in the case of our own company as well. Now it seems to me from these examples there are two or three things that we might include in terms of how we could improve our defense contracting program. The first one, I think, has to do with something that Roy mentioned and that's the flexibility of the contract. It's very difficult to provide the kind of communication between the user and the contractor in the rigid contracts that we have when sometimes the specifications are set up and there is no way that they can be deviated from. It was, in part, to try and overcome that concern, that we started the so-called prototype program and here my thought was that if you could simply get the definition of what the user wanted to the customer without too much detail specification, then you are more likely to come out with a better product and a development program that would take less time. Obviously, it's not practical to do this on a sole source selection without some changes up on the Hill. To do it with two contractors on a competitive basis seem to work out and I would encourage you people who are involved in this business to continue to look at the prototype approach because I think that does give you the kind of flexibility needed for an efficient new weapons program. It means you don't need to keep the specification too tight, keep flexibility in the development process and then on an operational testing program let the proof be in the pudding and that's the way it should be.

We started when I was here to program an operational testing program and, because I had the opinion at that time that our testing during development tended to be a little too theoretical, we really didn't get at some of the problems that needed to be checked out. We established an operational testing procedure and after a couple of years I got a communication from Bud Zumwalt. He said, you know these fellows have been complaining about these operational testing procedures you have set up. They say they're delaying the contracts and they're taking longer than they should and we're getting an awful lot of flak about this. So he asked me to come back and look at these contracts. I said, "ok, fine." If you'll accept my recommendations, I'll take some time out to come back and look at these contracts. And I did this. I looked at about six contracts and in every case the operational testing had shown up one or more serious faults in these weapons developments. Had these not been corrected there would have been a very severe problem with every one of these new weapons. I never followed up as to whether Admiral Zumwalt took my advice or not, but I encourage you to not downgrade this operational testing. It's a very important thing. Seems my time is getting toward the end and I want to make one comment and I repeat something I said very early in my exposure to this business. It is that "a weapon that won't work when it's needed is just the same as no weapon at all." I think that's something we've got to keep in mind at all times. We need to get more flexibility in our procurement to

recognize that. You must work together with the user, not only the logistics man but the fellows out in the field, the fellows that are actually using the equipment. As Roy indicated when you get out and see what's going on in the field, it makes a helluva lot of difference in terms of what you can do to correct problems that may arise. So that is a very brief summary of the problems. Perhaps a few suggestions that will be helpful and I'm very pleased to have a chance to be here.

PRESENTATION BY
WILLIAM J. WEISZ
MOTOROLA, INC.

Good morning ladies and gentlemen.

Whether a product be commercial or defense-related, the steps in its birth include identifying the need, defining performance specifications, creating a producible design, and finally, delivering production hardware and software to the user that works as close to perfectly as possible.

In the commercial world, a single organization, the company, is responsible for all the steps. The company can vary timing, modify specifications and in general, adapt to changing conditions. It can easily hold up a product that doesn't meet quality specs. In the world of defense contracting, some of the steps are a government responsibility, some industry takes on, and some are shared. Further, as a result of a protracted defense acquisition cycle, the requirement, the user, and the user's environment often change before the product can be delivered.

While I spent some time as an engineer in military development, I grew up primarily through the commercial operations of Motorola. Because of the split and shared responsibility in military product development, trust and cooperation must be superb. From my perspective of overview, in observing the relationship between industry and government in the U.S., it appears at times, that the teammates in the process have developed an adversary relationship.

While obviously unintentional, both parties seem to be so concerned with keeping the other from "doing them in", that the need to compete with other nations in the efficient use of resources has been obscured. Unfortunately, sometimes mutual suspicion seems to be the order of the day. We believe certain changes in the system, based on mutual trust, will greatly increase our ability to produce perfect quality products.

With these introductory comments as background, what can we tell you to do to help us?

A first and prevalent comment by our people involved in military equipment development is that insufficient time and resources are allocated for equipment designs to be iterated and validated for producibility and production readiness. Poor producibility is an unmistakable symptom of poor quality. Designs should be tested not only under realistic use conditions and military specifications - but also "tested to failure", so that design margins are documented. Production equipment should then be periodically compared to this documented baseline.

Second, we believe that the first production contract, which really validates equipment producibility, should be made the responsibility of the development contractor. To do otherwise is to let the development contractor's design staff off the hook.

Third, we believe that the firm fixed-price contract is the wrong way to go for state-of-the-art electronic development. The contractor is overly motivated to keep development costs down, and the government's interests are not served by having low development cost that results in a design that is costly and difficult to produce later on. Total system life cost, including poor producibility, poor quality, and the estimated cost of field failures, personnel and equipment out of service, etc., should be considered together with development and initial purchase price when procurement decisions are made.

Fourth, substantially increased feedback to the manufacturer on field performance and reliability should be systemized. Unlike our commercial businesses, in our defense electronics business where we deliver equipment to the field, or to prime contractors, we get only spotty quality feedback. We can only set improvement goals if we know the present level of field performance. We do get superb feedback from both our commercial and military semiconductor users. That feedback has enabled us to respond with improvements in quality and reliability.

Next, we support specification tailoring during the actual development of military equipment. The key watchword is to use high technology to make it simple. Simplicity does not mean unsophisticated. As development goes forward, any complexity or standardized government specification not absolutely required for actual field usage should be eliminated. That helps make it higher quality, lower cost, and much more reliable in the field.

Lastly, and most importantly, we believe that attitude is the critical issue. The Participative Management Program that we are using successfully in our commercial product organizations can work in our defense activities as well, but this requires a major change in the way things have been done in military contracting.

In 1968, long before Japanese quality circles were the "in thing", Motorola started a program in our non-defense businesses, called the Participative Management Program - PMP. We believe that every employee knows his or her own job better than anyone else - and therefore knows more about improving the quality of that job and reducing its cost than anyone else. We involve all employees, - not just factory workers, but also engineers, managers, accountants, etc. - to address how our products can be designed and produced more efficiently, with higher quality, and with better service to the customer. Unlike quality circles, however, when PMP goals are exceeded, the company shares the benefits with employees by paying a cash incentive over and above the employees' normal competitive salaries. But, poorer performance than our reach-out, targeted levels for quality, results in an unlimited "take-away" and, therefore, can eliminate any bonus that would otherwise have been earned

for improvements in cost or delivery schedule. The Participative Management Program has been tremendously successful in our commercial business, improving quality and delivery at ever-increasing lower costs than targeted, including the costs of the incentive payments.

Most of you know better than I the constraints on a defense contractor and the government in terms of pricing, audit, negotiation, and cost recovery. Will the overall defense contracting culture allow such incentive programs as PMP to function in a truly effective way? We are in the process of applying PMP on our defense contracts very slowly. We started out on some fixed price programs, for which there is the least controversy with DoD contracting practices. We now have a couple of R&D programs operating on the PMP plan. We have one customer who reluctantly agreed to the application of PMP to his program, and who has now agreed that the program is effective in motivating engineers to work together in a more cost-effective manner.

I strongly recommend to procurement officials that they find a way to encourage the most broad use of incentive programs, such as our Participative Management Program, even though they fly in the face of historical opinion on allowable costs. We believe such programs are critical factors in getting everyone working for better quality.

Improving quality and field reliability further, requires an increased level of cooperation, dedication, and trust exemplified by specific changes in the relationship between the partners - you and us. We pledge to do our part in cooperating with the Department of Defense to make it happen for you. As Dr. Juran has suggested - exhortation alone doesn't work - nothing improves by generalities - only by specific action.

Thank you very much.

PRESENTATION BY
WILLIAM E. HAGGETT
BATH IRON WORKS CORPORATION

Good Morning — It is a great honor for me to represent Bath Iron Works Corporation with such noteworthy participants on this program and in the audience.

BIW is an old and distinguished shipbuilding firm with over 8,000 employees in Bath, Maine, specializing in the construction of Navy surface combatant ships and merchant vessels. In addition, we are involved extensively in the overhaul and repair of similar ships. At present, Bath has ten guided missile frigates to complete, two new tankers for the Military Sealift Command and our first AEGIS cruiser. We also have five Navy combatant ships under contract to be overhauled.

I am very proud of BIW's performance and record in all the markets we serve. Bath made real commitments to quality, schedule adherence and cost reductions years ago which have paid huge dividends to our employees, the company, our customers and the American taxpayers.

Outstanding performance begins with management-led commitments to excellence -- a real bone deep desire to excel in all critical areas associated with the shipbuilding process. That desire must be reinforced with a breadth and depth of knowledge, including an awareness of the best shipbuilding equipment, technology and practices available in the world. Such attributes are essential to success, and when these are brought together in the proper balance, a shipyard (or any manufacturer) can produce high quality, on time and for low costs.

In delivering 14 guided missile frigates to date, BIW has been able to reduce follow-ship manhours consistently -- to the point where total hours are less than one-half of the lead ship's and production hours are 35% less than the first ship in the program. Meanwhile, measurable quality improvements have been experienced from ship to ship and follow-on ships have significantly enhanced machinery and combat system capabilities.

We believe that a ship's ultimate quality and cost relate directly to the quality and timeliness of work accomplished prior to the start of construction. Therefore, at Bath we have placed great emphasis on engineering, planning and procurement. First, of course, the concepts to be applied -- but ultimately, detailed dimensioning and accuracy control are given very high priorities.

Compared to others in this industry, I believe we spend more manhours in these front-end functions. In my view, BIW's investments in production methodology and high quality software have produced excellent returns. Still, we fall far short of perfection and find problems in the production process with interferences and faulty designs. But, our systems are designed and disciplined to assure prompt feedback so that the software is corrected and problems do not recur. In addition, we test and inspect -- but by far the greatest leverage is available during the pre-construction evolution. We apply the same practices, incidentally, on Navy and commercial programs.

BIW's current emphasis on designing in quality, supported by a rapid feedback system, was a direct result of lessons learned on the frigates. While we were pleased at the time with performance on that program, it is now obvious, with the benefit of hindsight, that much more can be achieved as we continue to discipline our systems.

On the FFG's, recorded re-work or unplanned labor dropped from 7.4%, or 161,000 manhours, on the first ship to .5%, or 7,000 manhours, on the 12th ship.

Acceptance Trial cards dropped from over 1,600 on the lead ship to 300 to 400 per ship on the follow ships and Quality Deficiency Reports were reduced from over 300 to about 25 per ship.

It is not surprising that every follow ship was completed earlier than the original contract date and that total production manhours dropped as each ship was delivered. Moreover, BIW was paid less for the 12th ship in the program, delivered in October 1982, than it was for the first or second ships, delivered in 1977 and 1979, and the shipyard's profit percentage increased.

Working closely over the last two years with IHI, Japan's leading shipbuilding organization, we have also gained a real appreciation for the importance of accuracy control in our business. Looking ahead, we see huge potential to improve quality and reduce elapsed time and costs by putting greater emphasis on accuracy control throughout the ship design and construction process. As a result, we have a full-time team of planners and engineers working this aspect of BIW's Advanced Technology Program.

To conclude, Bath's experiences would certainly confirm that there is a direct linkage between quality, schedule and costs in the design and construction of highly complex ships. If proper attention is paid to quality, then elapsed time and costs are minimized, assuming the other attributes I cited earlier are present.

Moreover, the optimum long-range benefits in all areas are gained by spending money and taking the necessary time on the front end to design in quality initially and then provide a feedback system which assures that production software is promptly corrected before the same error is repeated on follow ships. Trying to inspect quality into the product is necessary, but it provides what is clearly the least effective and most costly form of quality assurance.

Thank you.

PANEL 2 DISCUSSION

QUESTION: Is the current emphasis on cost control a potential threat to Quality Control by shortcutting testing and quality parts?

ANSWER: (Mr. Murrin.) I think the question asked if the present emphasis on cost control threatens the effectiveness of some of the things that were recommended here. I think the present emphasis on cost control, if it's the same initiatives that I have in mind, doesn't so much challenge the insight and recommendations that we've provided here, as it may challenge the emerging cooperation and teamwork between services and contractors. It includes, if we're on the same wavelength, an increased effort on so called should-cost studies. I would assert that if we direct much of our limited resources to making should-cost studies, which by definition has to be based on historical practices and really noncompetitive ways of doing things, we're not only going to lock ourselves into non-innovative techniques for designing and building military apparatus, but we're going to engender a new adversarial relationship in the process. I think that's a very serious problem. I speak only for myself, however, I don't want to implicate my fine corporation in this.

ANSWER: (Mr. Weisz.) I think that the answer is that we're all interested in lowest cost and frankly we believe, and I mean believe - not philosophize about the fact that quality produces lower costs. Phil Crosby, as many of you know, checked out the cost in commercial operations of poor quality, - and now you've got to deal with everything from the fact that the salesman wrote an order wrong and it has to be redone or the equipment failed in the field and he's got to hold the customer's hand or whatever, - and literally found out that the cost of quality with the company he was with was around 10 or 11% of the sales dollar. Most people look at cost of quality as being a warranty cost which was somewhere around 1/4 or 1/2 of a percent or whatever. When you talk about cost of quality being 10%, and we have validated that in our own company studies in different operations, and you now say that you have a 10% cost that you've got to get out of there, the ability to attack that cost is very, very much more attitudinally appropriate, and you know we try to measure everything down to the last gnat's eyebrow. The problem is that while quality is free, - quality in the end result on a system long term life basis - it costs an up front investment cost. It may be an investment cost in more engineering, more detailed engineering and up front it looks like it's more costly. In the long term, it's very, very much less costly and we'll save money. Our problem is to convince people. That's why I talk about trust. That without trying to measure everyone of these things down and insure an immediate payback into short term, we've got to look at the system cost of the activity and we've got to do some things and take some gambles with investments which requires Government contracting people to be willing to help fund it because we know down deep and we've validated commercially that we'll get it back. If we only look at this short term cost, the cost of procurement, the cost of a development contract and can't

consider all of the rest of these costs that are equally debilitating and forget about what their dollar cost may be, it may literally cost us and the customer the battle. Then I think we're in real trouble. That's where we fail. We don't make that kind of a long term consideration. So cost is not a bad thing to talk about. But let's talk about it in the right context.

QUESTION: Admiral Foley indicated that the commercial market place tends to produce more reliable equipment than perhaps DoD equipment and several of the panel members also alluded to this. I wonder if the panel would address the issue of whether we should try to introduce more of the commercial market place environment in DoD acquisition and how that might be done?

ANSWER: (Mr. Murrin,) The question observes that some of the earlier speakers made a point that commercially produced and available equipment is often times judged to be of higher quality and more reliable than comparable military equipment. That suggests that we ought to try to change the environment in the defense arena more toward that which is found in the commercial arena. Do you have some views about that Dave?

ANSWER: (Mr. Packard.) Yes, I would like to comment on that. I think it is true that quite often commercial equipment can be both better and less costly than equipment developed under military specifications. Our company has had a long history in this regard since, as I indicated, we specialize in test equipment and quite often, over the years, one of the services would undertake to have a signal generator, for example, developed and by the time they got through with it, it turned out to cost more than one that we had developed and had made available commercially and was not as good. During the last couple of years fortunately there has been a recognition of this and the services are purchasing more commercial products where those products can be demonstrated to be adequate and quite often they can be not only adequate, they can be better. One of the real problems as you know, in the electronics field in particular, technology is moving so fast that the cumbersome procurement process makes it very difficult to get a product out before it is obsolete technically and a commercial firm must do that. We had one example of the most rapid development and have it in production. Now you can't possibly get anything started in less than 2 or 3 years just in the amount of talk necessary in a military program. Now we can't do it all in 1 year either but I think there is a real opportunity to use more commercial equipment and many of us are finding that the military environment specifications that have been used over the years are not all that bad for commercial products. Our company is testing most of our commercial products under the environmental conditions that are stipulated in military specifications. So you're getting the commercial product developments, I think, to come a little bit more closely in line with the environmental conditions that you encounter in the military environment. I would encourage this consideration of commercial products to continue. I think it is a positive trend.

QUESTION: I have a question for Mr. Packard. I wonder if you could share with me what the three companies that you talked about may have learned about dealing with their vendors, their suppliers, rather than just what they do internally. It would seem that that would be very important.

ANSWER: (Mr. Packard.) Well, when I talked about these three firms, I was really referring to their commercial business and I didn't get into the vendor side of it, but any firm that has a commitment to quality has to be concerned not only about the workmanship of his own people but he has to be concerned about the quality of the material and the components which go into those products. We found in our company over the years that quite often the components were a serious problem in terms of reliability. A couple of years ago in looking at the requirements for 16K memories for some of our computer products, we learned that we could get considerably better quality from our Japanese suppliers than we could get from our United States suppliers. Accordingly, we had no choice but to go to Japanese supply sources for those components. At the same time we have undertaken to work with the American suppliers and at the last evaluation I saw, there was no significant difference between the quality available from the American suppliers and Japanese suppliers on these particular kinds of large scale integrated circuits. It's important for a firm that is dedicated to quality to work with their vendors because their vendor's contribution is extremely important, and here again it should be a close working relationship, not a give or take situation. I think that the more we can look at this problem as a partnership working together between purchaser, the manufacturers and the vendors, the more we'll realize that we're all in this together. Only by working together are we going to be able to achieve the best quality, the lowest cost in whatever objectives we have. So I think you've got to look at this thing as a partnership in both directions from the manufacturer to his customer and from the manufacturer to his supplier, to his vendors.

ANSWER: (Mr. Weisz.) I would add that I think that that does one other thing. Most of us are narrowing down the number of suppliers we deal with and dealing with them in this cooperative fashion on a much longer term basis through thick and thin, if you will. The issue of buying low price and jumping back and forth between suppliers on a continuing basis has gone by the board. It doesn't make any difference whether its electronic companies or automobile companies or whatever. We pick the best supplies and then we're going to work with them on a continuing basis and if they get in trouble or we get in trouble, we're going to work it out. We're not going to dump them and go on to somebody else. So that kind of relationship over the years has been developing. As a matter of fact, as Dave pointed out, his company gave its first ever corporate quality award about two months ago in the integrated circuit area and the recipient was Motorola, and it was because of that kind of relationship.

STATEMENT: (Mr. Murrin.) Frank, we probably couldn't end on a happier note than what Dave and Bill have provided. On behalf of the panel let me say we are delighted to have participated with you.

PANEL III



BOTTOM LINE II CONFERENCE

1 JUNE 1983



PROFESSIONAL QUALITY LOOKS AT INDUSTRY

**MODERATOR: MR. NORMAN AUGUSTINE, PRESIDENT, DENVER AEROSPACE,
MARTIN-MARIETTA**

**MEMBERS: DR. JOSEPH M. JURAN, CHAIRMAN, JURAN INSTITUTE, INC.
DR. J. STUART HUNTER, PROFESSOR EMERITUS,
DEPARTMENT OF ENGINEERING, PRINCETON UNIVERSITY
DR. A. V. FEIGENBAUM, CHIEF EXECUTIVE OFFICER, GENERAL
SYSTEMS CORPORATION
DR. ALVIN GUNNESON, CHIEF EXECUTIVE OFFICER, THE
GUNNESON GROUP, INTERNATIONAL**

QUALITY - THE VITAL LINK

PRESENTATION BY
MR. NORMAN AUGUSTINE
DENVER AEROSPACE, MARTIN-MARIETTA

It's great to see such a good turnout here. First, it's good to know there are so many of us interested in quality and second, it's good to know that I'm not the only one who didn't get invited to the Paris Air Show!

General Jack Deane, a great soldier who commanded the Army's Materiel Command a few years ago, once told me the definition of an American GI. He said an American GI is a person you can put in a perfectly barren desert, wearing nothing but a bathing suit, and having nothing in his possession except an anvil and leave him overnight—and if you come back the next morning the anvil will be broken.

Now having spent a little time with the Government myself, I've come to conclude that this story is more attributable to the poorness of our anvils than the problems with our GIs. Indeed, today, our distinguished panel is here to make some suggestions to better our record—to put industry under the microscope, so to speak, and tell us how we can figuratively build better anvils.

It's certainly frustrating to a GI to have a device that doesn't perform as it should. It's not just the big items; very often tiny items can cause a big problem in the quality area. A chip of gold smaller than a human hair caused the loss of one of our major space missions.

We all know quality has to be designed into a product—we can't try to put it in after the fact by testing or wishing. Take the case of a surface-launched missile in the Army inventory that had two vehicles connected by two very, very large cable bundles. To make sure there was no possible way these two cable bundles could be inadvertently connected improperly, one was an 18 pin connector, the other a 20 pin connector. But the design of the connector was such that sure enough, the world's strongest GI managed to connect them in reverse! Now that could have been prevented, of course, by designing a connector that you just couldn't mate incorrectly.

A lot has been said today about the quality of hardware. It's also important that we don't overlook the quality of software; which is getting to be one of our most important and most expensive products. Many of you, I am sure, are familiar with the case where a hyphen was left out of one of the loops in the guidance equation for a space probe. That probe took off to explore its own part of space and the mission was lost just because the hyphen was omitted. So, one also has quality problems in software,

and perhaps when we meet again ten years from now this will be getting more discussion than will the hardware.

Our speakers today are going to offer some solutions to our problems. I therefore thought I would propose in my brief introduction two things that I believe are not solutions. The first thing that is not a solution is to simply throw more money at the product trying to get quality. The chart shows a plot of the mean time between failure on the ordinate versus the unit production cost on the abscissa of a large number of items of airborne avionics. These items range all the way from simple marker beacons to multichannel fire control systems. "Obviously, if you spend more money you get better reliability," or some would have us believe. The curve would therefore follow the arrow and slope upward to the right, because no one would spend more money to get less reliability. Let me now show the actual data which is just as we would expect except that it slopes downward to the right! I would like to join the school of thought professed this morning that life doesn't have to be that way. Unreliability is certainly not synonymous with high technology. The problem is it can be; and all too often I fear it has been.

The other approach that I know is not a solution is to throw more paper, more slogans, more posters, regulations and so on at the matter of trying to obtain reliability or to legislate maintainability.

Fortunately, problems with quality have not been unique to our country. Witness this photo of a Soviet-built air-to-air missile that was "captured" in the tail pipe of an F-4 in Vietnam. The missile penetrated the tail pipe and did not detonate, was flown home and "captured" by the crew of the F-4! That was the good news. The bad news was that air-to-air missile design the Soviets used was copied largely from stolen drawings of ours.

The fact is that we are simply going to need to be better in the reliability and quality assurance areas. It will take a lot of attention. It will take a lot of motivation. But I believe it is not hard to get motivated about things your friends, other Americans, are going to stake their lives on. Certainly those of us in industry as well as those in Government have a clear challenge before us.

With those brief introductory comments, I would now like to introduce our panelists.

PRESENTATION BY
DR. J.M. JURAN
JURAN INSTITUTE, INC.

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New York, NY 10017

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TEXT

At last year's Bottom Line Conference my subject was Upper Management and Quality - A New Direction. In that paper I prescribed "Three Breaks With Tradition," consisting of:

FIG 1

1. Annual improvement in quality year after year
2. Massive training for the entire management team
3. Hands-on leadership by upper management

At Admiral Collins' request, copies of that paper have been made available to all of you. You will find the paper in the booklet The Juran Report, behind the Great Wall of China, starting on page 12. I respectfully suggest it would be worth your time to study it.

RECENT GOINGS ON

Let me now share with you some observations about what the upper managers of our industrial companies have recently been doing with respect to quality. These observations are based on the last five years of on-site meetings with upper managers in nearly 200 influential companies, in the USA and in Europe.

The actions taken by these upper managers have usually included the following commonalities:

FIG 2

They have all sensed that we are in a crisis atmosphere with respect to quality.

Virtually all have concluded that some major response is needed - some major change in company direction.

Many have publicly proclaimed that quality is now to have the highest priority among company goals.

Many have publicly proclaimed the additional goal of making their company the quality leader in their industry.

Virtually all have urged their subordinates to take action to meet these goals - to give quality top priority and to bring the company to a state of quality leadership in the industry.

At this point the road diverges. Upper managers have been trying out various directions in their efforts to reach these goals. Three of these directions deserve special mention here.

EXHORTATION ONLY

FIG 3

Many upper managers have restricted their own role to creating a climate favorable for improving quality: setting priorities, establishing goals, and publicly proclaiming the need to improve. These same upper managers then urge their subordinates to meet the goals.

I call this the exhortation approach because the upper managers typically do not become involved in the so-called details of mobilizing for action. Instead, the upper managers limit themselves to exhortation, using slogans such as "Do it right the first time."

The exhortation approach is understandably attractive to many upper managers. It certainly enables them to increase the visibility of the goals and to get their message across. It also seems to enable them to unload a sticky problem on their subordinates, but that is a delusion.

I am on the receiving end of a good deal of feedback from middle managers as well as upper managers. To those middle managers whose bosses have opted for the exhortation approach the new priority on quality is just another in a long series of prior "drives." Each such prior drive was launched with the upper managers very much in evidence, through speeches, letters, posters etc. Each drive was advocated by enthusiasts who promised glowing results. Then, following the launching, the upper management participation evaporated. The middle managers were left with the problem of how to deal with yet another responsibility superimposed on the workload of busy people. Subsequently, the results fell far short of the promises of the advocates. It should come as no surprise that such prior histories have built up a thick crust of skepticism. The phrase I hear most often is "Here comes another one."

Note also how that popular slogan "Do it right the first time" has different meanings depending on whether one is on the transmitting end or the receiving end.

FIG 4

The most graphic description of the exhortation approach came to me from a company president. In a company conference of top managers he stated it this way:

"We are not going to become cheer leaders for our subordinates. We are going to lead by setting an example."

PANACEAS

In this approach the upper managers go beyond exhortation. They choose some narrow remedy which they then urge as a panacea for all the company's quality ailments. There are many such narrow remedies: QC Circles; control charts; reliability models; etc. Each has value but only with respect to selected problems. None is a panacea which solves all quality problems.

The panacea approach is fatally defective because it does nothing for the great majority of the company's quality problems. Our model compares the problems of quality to those of human health. We have many quality problems or diseases. We also have many solutions or remedies, but there are no panaceas. If we solve disease Number 3 by use of remedy G, the remaining diseases just go on and on.

FIG 5

HANDS-ON LEADERSHIP

In this approach the upper managers participate actively in the train of events needed to create and institutionalize annual improvement. Beyond setting the goals they:

FIG 6

Agree on the deeds - the projects - which must be carried out in order to reach those goals

Assign teams with clear responsibility for doing those deeds

Establish the reports needed to enable upper managers to follow progress

Revise the system for judging managers' performance to include performance on meeting the quality-oriented goals.

This approach is elaborated in the paper I presented at last year's Bottom Line conference, and I again respectfully refer you to the reprint in the Juran Report.

In my observation, upper managers who provide this hands-on leadership are outperforming those whose approach is limited to exhortation or panaceas.

ROLE OF GOVERNMENT MANAGERS

For the remainder of this paper I propose to address the government managers. They have vital roles to play in quality improvement, both in the industry sector and in the government sector. To play these roles requires that the government managers also make some major breaks with tradition. These Bottom Line Conferences cannot be regarded as compre-

hensive if they address themselves solely to industry managers.

ENCOURAGE CONTRACTORS TO ESTABLISH ANNUAL IMPROVEMENT

In my view, the government managers should strongly encourage contractors to establish effective approaches to annual improvement. The methods used for this encouragement should be carefully chosen, and would normally include:

Make the presence or absence of effective annual improvement a factor in the decision to award contracts

Nominate major projects to be tackled - those projects which can result in significant improvement in product performance or in overall cost to the government.

Some of the most important projects are so broad as to require joint government-industry teams. Others affect multiple companies in the defense industry. Such broad projects may well require special funding before an initiative can be forthcoming.

The carefully chosen methods of encouragement should be oriented to results, not to the specific means for securing those results. During the 1960's we had a wide scale demonstration of what happens when the means become the end. In that decade government managers pressured contractors to put on motivational programs to stimulate the work force to do perfect work. The contractors dutifully met their customer obligations by holding colorful spectacles complete with publicity, speeches, banners, posters and slogans. What was mostly absent was useful results.

In my view, government managers are well advised to stay away from any tendency to micromanage the activities of the contractors.

ESTABLISH ANNUAL IMPROVEMENT WITHIN GOVERNMENT

Finally, I suggest that it is now time for government managers also to establish annual quality improvement within government operations, on an institutionalized basis. The reason is that a great deal of the poor quality and high cost of defense products has its origin in causes which only government managers can remedy. These deficiencies are too serious to be left to the evolutionary pace of past improvements. What is needed is a break with tradition - a revolutionary pace of improvement. We have all learned that evolutionary improvement is not enough to provide continuity of leadership in quality.

FIG 7

There are legions of potential improvement projects for government managers to tackle. For example, we have some very important military systems for which the annual cost of maintenance exceeds the original acquisition cost. Most of these projects relate to specific products or systems. There is a structured methodology for identifying such projects and for organizing to deal with them. I discussed that methodology briefly in my 1982 Bottom Line paper.

Beyond the projects which relate to specific products or systems, let me add some projects of a broader nature. I am stimulated to do this because Admiral Collins had asked me to include some observations on MIL-Q-9858.

I do have some observations to make. MIL-Q-9858 is out of date and needs overhaul. I have included some examples in the full paper.

However, even greater is the need for review of the policy behind MIL-Q-9858. The present policy of government-contractor relations is adversarial in nature. It should be changed so that a teamwork relationship can evolve. This evolution would naturally result in fewer contractors, long term relationships, joint quality planning and hopefully, greater mutual trust.

FIG 8

In addition to such a change in basic policy there is need for some researches of a broad nature to assist in decisions on grand strategy with respect to quality. Here are some nominations I put before the Second NATO Symposium on Quality and Its Assurance (London, 1977):

Alternatives for prediction of contractor performance. MIL-Q-9858 and its derivatives rely primarily on surveys or "assessments" of contractor organization, procedures, data systems, etc. I have seen no convincing proof that these features are valid predictors of subsequent quality.

FIG 9

Autopsy of unsuccessful contracts. Such a research would parallel the widely used analysis of product field failures to discover the vital few causes so that remedies can be applied.

How to improve the balance among product performance, operational readiness and life cycle cost. There is much evidence to suggest that we lack adequate balance due to suboptimization i.e. each of various echelons of organization emphasizing their respective departmental missions.

Alternatives for accelerating adoption of life cycle costing. This valid concept is making headway but at an agonizingly slow pace. Yet it represents one of our truly great opportunities for improving national productivity.

We often describe the organization for defense as consisting of the government-industry team. That is the ideal concept, and it requires contributions from all members, including breaks with tradition, if needed for the common good. The need is there and we all hope that all team members will rise to the occasion.

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THREE BREAKS WITH TRADITION

ANNUAL IMPROVEMENT

MASSIVE TRAINING

HANDS-ON LEADERSHIP

**(THE JURAN REPORT,
PAGES 12-26)**

COMMON CONCLUSIONS

WE ARE IN A CRISIS

A RESPONSE IS NEEDED

QUALITY GETS TOP PRIORITY

WE MUST BECOME NUMBER ONE

LET'S GO!

EXHORTATION ONLY

CREATE FAVORABLE CLIMATE

SET PRIORITIES

ESTABLISH GOALS

PROCLAIM PUBLICLY

EXHORT

DO IT RIGHT THE FIRST TIME

DO IT RIGHT THE FIRST TIME

THE SAME MESSAGE AS VIEWED BY:

THE TRANSMITTER

A NEW, TIMELY
GUIDING PRINCIPLE.

THE RECEIVER

TRITE, OLD HAT
AND AN IMPLIED
INSULT.

THE ROAD TO PANACEAS

PROBLEMS (DISEASES)

- 1 *~~~~~*
- 2 *~~~~~*
- 3 *~~~~~*
- 4 *~~~~~*
- 5 *~~~~~*
- 6 *~~~~~*
- 7 *~~~~~*

SOLUTIONS (REMEDIES)

- A *~~~~~*
- B *~~~~~*
- C *~~~~~*
- D *~~~~~*
- E *~~~~~*
- F *~~~~~*
- G *~~~~~*

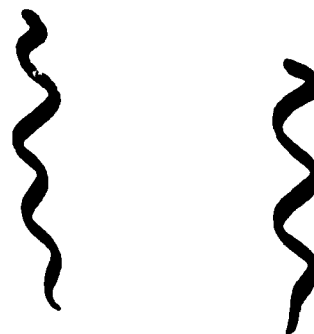
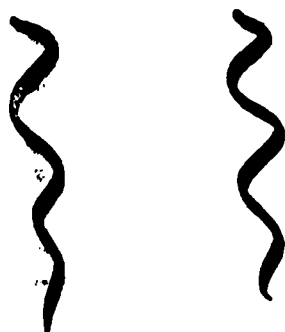


FIG 5

HANDS-ON LEADERSHIP

AGREE ON THE DEEDS—THE PROJECTS

ASSIGN CLEAR RESPONSIBILITY

ESTABLISH PROGRESS REPORTS

**REVISE THE SCOREBOARD FOR JUDGING
MANAGERIAL PERFORMANCE**

FIG 6

WORLD COMPETITION IN QUALITY

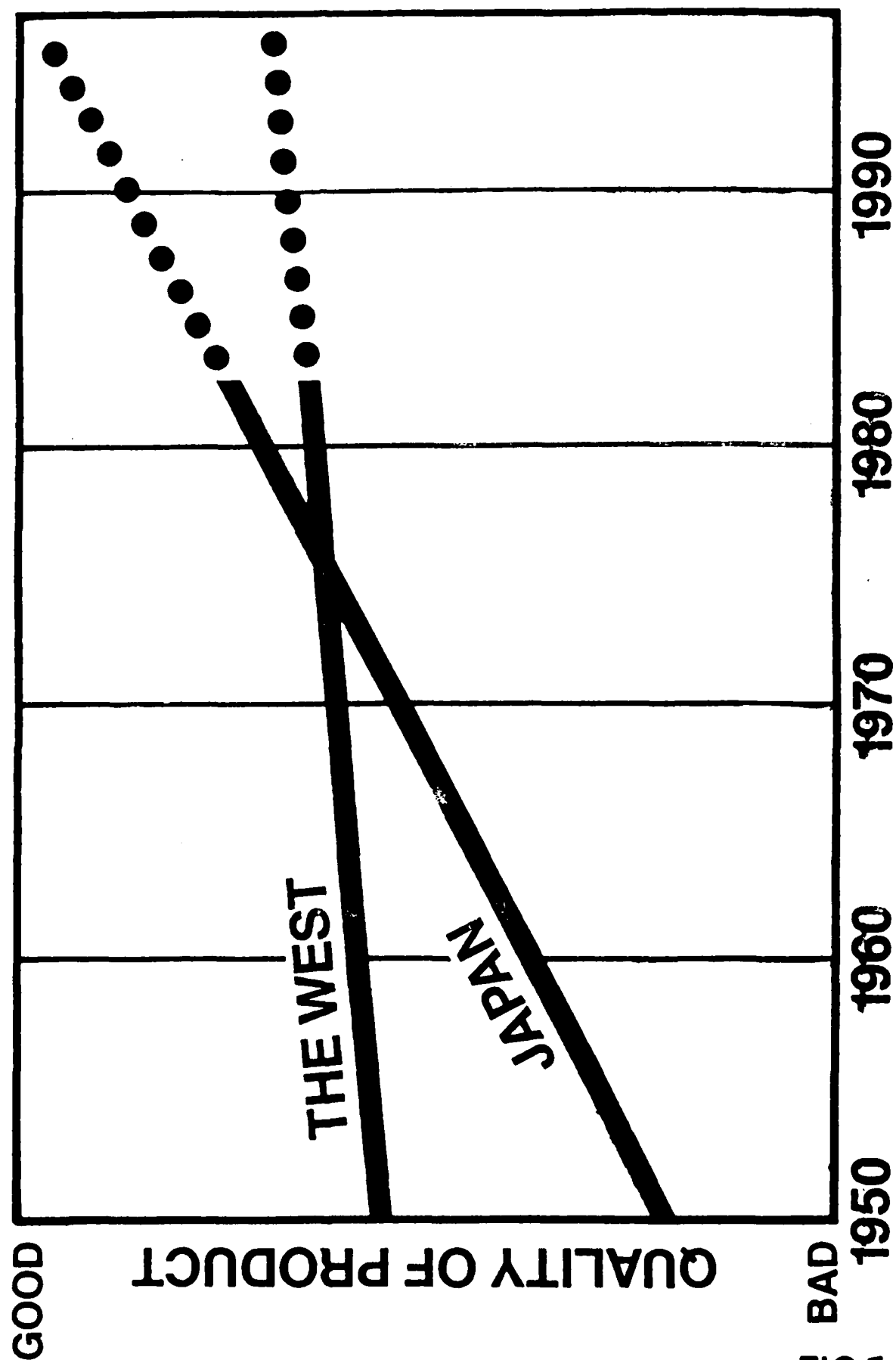


FIG 1

RELATIONS WITH CONTRACTORS

ADVERSARY TO TEAMWORK

FEWER CONTRACTORS

LONG TERM RELATIONSHIPS

JOINT QUALITY PLANNING

MUTUAL TRUST

NEEDS FOR RESEARCH

**ALTERNATIVES FOR
PREDICTING CONTRACTOR
PERFORMANCE**

**AUTOPSY OF UNSUCCESSFUL
CONTRACTS**

**IMPROVE BALANCE AMONG:
PRODUCT PERFORMANCE
OPERATIONAL READINESS
LIFE CYCLE COST**

**ACCELERATE ADOPTION OF
LIFE CYCLE COSTING**

PRESENTATION BY
DR. J. S. HUNTER
PRINCETON UNIVERSITY

To remain competitive with other industrial nations, and particularly with Japan, American industry will have to pay greater attention to the quality of its products and to the efficiency of its production processes. This overall product-process problem can be encapsulated into the single word "Quality." Most of the origins and the solutions to America's quality problems rest with management.

Today's "Quality" Activities

As a first step, American industry is beginning to emulate many of Japan's manufacturing practices. The highest echelons of management have become personally committed to the pursuit of quality, and organizations have been restructured to make "quality" both a staff and a line function. Vendors are now asked to demonstrate proof of the quality of their products, purchasing departments encouraged to reduce the number of vendors, and "just in time" (Kanban) production inventory methods introduced. The style of American management is also changing. "Quality Circles", a participatory management procedure borrowed directly from Japan, is being introduced, while the worker on the production floor is encouraged to "do it right the first time" and to become a self-monitored, quality-conscious individual.

Unfortunately, commitment, re-organization and motivation on behalf of quality, in and of themselves, are incapable of closing the performance gaps that separate most American and Japanese industries. Also required will be heavy infusions of quality technology of both a hardware and software variety. By "hardware" we mean the institutions of modern production equipment, CAD/CAM systems, robotics, computers, and investments in new production processes and designs. Interestingly, many investments in quality technology hardware have already been made: all that was needed was capital.

Much more neglected and more difficult to acquire are the "software" aspects of quality technology; that is, the ability to create the information that will lead to the enhancement of quality and the improvement of process efficiency.

Modern Statistics

We argue that if modern managers wish to produce information useful for solving the problems of "quality", they must become aware of the modern tools of statistics. W. Edwards Deming taught elementary statistics to Japan's upper management in the 1950's, and his courses were later vastly extended to include all levels of personnel. Japan's present investments

in education in the arts of statistics are continuing and large. During World War II, similar efforts were made in the United States, but they have since seriously atrophied.

Although teaching statistical methods for quality improvement is on the increase in the U.S.A., most of this educational effort is aimed at expositing those arts of statistics that were au-courant at the conclusion of World War II. American industry seems content to import back from the Japanese the very same statistical tools that Dr. Deming elucidated forty years ago. Those entering today's quality battles within the United States are being trained to fight with yesterday's weapons. Little effort is presently made to acquaint managers, or to train an experienced cadre, in the modern statistical weapons of quality technology. To illustrate, consider the following example.

Today, it is common to emphasize the usefulness of the Shewhart control chart: a method for plotting a regularly measured response (such as the tear strength of a sample sheet of paper). The plotted points resemble the chart of a closing stock market price, except that additional horizontal control boundaries are superimposed to indicate when the plotted points go "out of control". When two different responses are measured (say, paper tear strength and fiber content), it is common to construct and evaluate two separate Shewhart control charts. An opportunity frequently neglected is to co-plot the data, and to establish control boundaries appropriate to both responses considered simultaneously. A bivariate control chart can provide more appropriate, and often dramatically different, signals than those offered by the separate univariate charts. In general, whenever univariate charts are used in place of bivariate charts, information on process performance is lost, and mis-information frequently offered.

If bivariate (and multivariate) charts are so much better, why, one might ask, haven't such charts found wider use? Arithmetic is the answer: extensive computation is required to establish the bivariate control boundaries. But arithmetic can no longer be used as an excuse. Today's hand-held calculator is easily programmed to complete the arithmetic in a few seconds. There is little excuse for not trying to employ multivariate charting techniques. Monitoring today's processes with one-variable-at-a-time methods is to throw away information.

Today's hand-held and desk-top calculators provide the manager, as well as the production worker, with computing abilities far beyond the imagination of the statisticians who originally established control charts. These computing instruments dramatically increase one's opportunity to employ a vast number of modern statistical methods simply by eliminating their associated arithmetical burdens.

Acquainting America's managers and workers with the standard Shewhart chart is important. It is also insufficient. Alternative charting techniques (multivariate, CuSum and EWMA) also need emphasis, along with very new techniques such as the QMP chart now extensively used at Western Electric.

Data vs. Information

Today's large computer is often employed as a number bin; that is, a device for storing large quantities of production process data. Can modern statistical methods, using the computer, uncover useful information from these numerical records? Yes and no. Many statistical tools, as for example multiple regression and cluster analysis, do exist to aid the statistician in ferreting out information from a historically collected data set. However, large numbers of numbers, and sophisticated statistical methods, do not necessarily produce anything useful. There is an important difference between data and information.

Most stored production data are the archival record of measurements made at some transitory historical moment. The value of these data as information relative to today's quality questions rapidly fades as time passes. The very quantity of data is itself often a handicap, with poor data, cheaply acquired and more voluminous, serving to dissipate the contributions of good data. Some statisticians call the analysis of historical production data PARC analysis: Practical Accumulated Records Computations. Read the acronym backwards.

Data management, by which we mean the collection, storage and retrieval of numbers, is important but secondary to the need to provide answers to questions, i.e., to the creation of information. Commonly, the "quality" manager saves his data in the hope that tomorrow's question can be answered with yesterday's numbers. The creation of information more properly proceeds by first asking the questions and then organizing for the necessary data.

Passive vs. Active Statistics

It is not widely recognized that statistical quality control, acceptance sampling procedures, and the many methods for the analysis of historical data, all represent the passive use of statistics. They play a role analogous to that of a physician who, on visiting a patient, sits and listens to what the patient has to say. Of course, a great deal can be learned through listening. But, obviously, much more could be learned through active questioning and testing. So, too, with industrial processes. "Quality" managers must learn to interrogate their industrial processes; that is, evoke the active uses of statistics. Statistics in its active mode requires the planning of experiments.

Experimental Design

A proposal to experiment with an on-going production process can stimulate a variety of reactions on the part of the production manager, ranging from outspoken hostility, through scorn, to trepidation. To many managers, "production" and "experimentation" are antithetical. Nevertheless, it is simply true that experimentation goes on in every production process: a small variant tried here, another small change there: "small" because any large change might have immediate deleterious consequences on throughput or quality. Of course, small changes usually have small effects, and the investigator's problem then becomes one of detecting the effect of the induced change. It is usually difficult to state with any confidence that any effect has occurred given the variability of product and measurement that attends most production processes. Industrial process

experimentation thus becomes an informal procedure, with much data generated, but little information.

Required in this industrial situation is the application of a little "enlightened empiricism"; in brief, the application of simple statistically designed experiments. Planning a useful experiment requires the investigator to ask a careful question, choose factors to be studied, and arrange appropriate response measurements; all good experimental as well as statistical practices. But, with statistically designed experiments, it is easy to study the consequences of varying more than one factor at a time; in fact, it is strongly encouraged. In addition, data taking sequences can be arranged to reduce (block) unwanted sources of variability. Recently, in Japan, the use of "parameter" and "allowance" designs has been encouraged by Genichi Taguchi, one of their leading industrial statisticians. The subject of statistically designed experiments is a very broad one, and has been used successfully in every science. Remarkably, although statistical experimental designs are easy to plan, conduct, and analyze, they are currently seldom used by production personnel. This failure represents a serious loss of opportunity to learn about quality improvement where it can count most: on the production floor with production personnel the major driving force.

Conclusion

Management must couple good organization and motivation with modern quality technology if American industry is to remain competitive. Quality technology has obvious hardware aspects. But equally important are its software aspects: the production and analysis of meaningful quality information, not just production data. Today's "quality" manager must adapt the active as well as the passive modes of modern statistical practice.

There are many explanations as to why modern tools of statistics are not used more resourcefully. Most of today's teaching of statistics to "quality" personnel is a repeat of that offered at the conclusion of World War II. Many of the newer techniques require substantial arithmetic, but that was yesterday's excuse. However, if today's "quality" managers continue merely to re-learn the statistical arts of their World War II predecessors, they will never catch up to their Japanese counterparts. The leap forward to real competitiveness will require the application of statistics in its modern active modes.

PRESENTATION BY
DR. A. V. FEIGENBAUM
GENERAL SYSTEMS COMPANY, INC.

QUALITY EXCELLENCE AND TOTAL QUALITY

It is a privilege to be part of this meeting oriented to quality excellence. I welcome the opportunity to bring to today's discussion some comments on this subject of quality improvement from experience over the past many years in installations of large-scale quality management programs in various parts of the world.

A starting point is to consider why, over the past several years, some very strong companies have been seriously blindsided in quality while some others have been able to use the same upward quality demand to increase their market position and often their product profitability.

One pattern we see in some products is shown on this slide which plots user quality satisfaction on the vertical scale against time on the horizontal scale. As shown in the lower trend line the company has, in fact, been making quality improvements on a continuous basis that was considered in-house to be an acceptable rate. Because it had improvement programs, the company felt reasonably comfortable about product quality.

However, as shown in the upper trend line which I've smoothed out for this purpose although it is actually sinusoidal, user quality expectations for the product had unfortunately been increasing at a far more rapid rate -- leaving what might be thought of as a quality gap for the product.

For just one small example of the reason for this, escalating data use requirements in complex electronic systems products were beginning to make parts per million quality performance a requirement in the product's semiconductor usage rather than the parts per thousand performance that was in fact being used as the benchmark. The quality program was simply not keeping up with real user requirements, and the resulting quality gap reflected the blindside vulnerability caused by the product's growing inability to deal with basic user reliability demands. But more in a moment about this kind of quality gap and the steps for dealing with it when it exists.

I want to now mention that the pattern of products which have used quality as a competitive edge is quite different from this. As a matter of policy, these companies try to make their quality improvement programs the pacer for the upper user satisfaction trend line or in any event to target their quality improvement program to approach it as closely as practical without permitting a user quality gap to develop.

The programs that are successful in doing this are far different from half measures such as the fireworks display of one-time quality encouragement

programs or through dusting off the application of a few traditional quality control techniques.

Quality excellence is instead, in my experience, the result of hard and unrelenting work in three areas:

The first is clear and continuous management emphasis upon spelled out quality leadership -- in effect, gearing to the upper quality trend line. The second is strong and effective investment in quality technology and attention to quality execution itself -- the how-to-do-it part of quality. This is emphasized not only throughout production and service but also in development engineering and in early manufacturing, in both of which areas quality's impact has too often been uneven. The third is top to bottom commitment to quality and measurement of its results -- all built on the foundation of a strong and explicit quality management program to keep this work moving forward.

Closing quality gaps where they may exist and riding the top quality trend line depends upon clearly and objectively sizing up the organization's present quality strength in each of these three areas and in then quickly putting in motion the improvements as they may be necessary. I'd like to comment on some of the factors I've found especially important in doing this.

The first area, quality leadership, today means a policy commitment to the engineering, production and sale of products that consistently will perform correctly for users when first purchased, and that with reasonable maintenance will continue to perform with very high reliability and safety over the product life. Unless the management of a company clearly defines to the organization the specific quality results that are required, and then plans and budgets the specific resources for manpower, equipment and systems to meet these priorities, the quality results are not going to come about.

This kind of quality leadership policy, oriented to defect-free, high reliability product results, makes a much heavier quality improvement demand on an organization than the traditional policies of quality satisfaction that have primarily meant that product service and technical assistance will be readily available to users. Assurance that a company "will always fix a product so that it will work again for the user" is honorable and important. However, it represents a policy of service to deal with product problems, it is not a policy to serve user expectations for the delivery of products whose performance you can consistently depend upon.

The second area is to implement these quality goals by means of consistent quality operating practices -- quality disciplines, if you will -- executed by each individual in each function throughout the organization within a conscious program of multifunctional quality coordination. The kind of interfuctional integration needed for major quality improvement is more than merely a token slip-knot that opens up whenever quality pressures build. It instead recognizes that the big user quality improvement problems usually transcend and do not respect individual functional boundaries within companies and that today, the quality program has to be structured accordingly if it is to be genuinely effective. Doing this is not a matter of any particular organization format.

This will vary depending upon circumstances. But it is a matter of the organization recognizing that the execution job is to manage and integrate product quality thoroughness and depth through which the product itself is managed and engineered and produced and sold.

The third area is in the capability to motivate and measure quality clearly and effectively enough so that the greatest quality resource of an organization -- the knowledge, skill and attitudes of employees -- is fully utilized. There are many factors required to achieve this as you very well know -- continuous managerial personal example; organization-wide training; quality participation that is widespread. However, in my experience, it is very deeply influenced by the degree of genuine involvement and commitment of middle management, which is the area at which I personally always look first when I walk a factory floor or an office area.

Further, concerning quality measurement itself, by far the most important area is tracking user satisfaction itself. Not only from reports that come back from the field but especially also emphasizing the practice of design engineers and production people getting directly out with the user. Programs for doing this have had a very positive effect, not only on the engineering and production people but also on the user.

Another important in-house mechanism for tracking the effectiveness of quality improvement is the cost of quality itself. This is because less than satisfactory quality means less than satisfactory resource utilization and involves wastes of material, wastes of work force effort and wastes of equipment time -- and consequently higher costs. In contrast, satisfactory quality means satisfactory resource utilization and consequently lower costs.

We have been measuring the costs of quality in companies for many years and the chimney chart in this slide shows a cost mix we frequently see in products as a percent of revenue. The chimney chart covers the costs of failure of control -- including in-house costs such as scrap and rework shown in yellow and user-oriented quality costs such as complaints shown in red. It also includes the costs of control itself -- inspection, testing and other quality controls shown in blue and the preventive costs for quality improvement shown in purple. Obviously, the real money is tied up in failure cost segments of quality costs.

Our experience over the years is that strong and effective quality management programs, which place the necessary emphasis upon preventive activity reduce these failure costs very significantly -- thus reducing total quality costs substantially. As a corollary, this enhances productivity because it converts into good product the hidden plant resulting from the failures. In so doing, it helps the quality improvement program lay to rest the still very pervasive myth that better quality invariably costs more. Just the reverse is true.

Taken together, these three areas of quality leadership or detailed organization-wide quality execution; and of top to bottom commitment and measurement provide the basic components for strong quality. They represent management programs that can have a very favorable effect on giving the entire

organization from top to bottom a stake and share in quality achievement. It is a tremendous satisfaction when you are a part of this and see it work on behalf of quality improvement.

I appreciate this opportunity to join with you in today's phase of our collective pursuit of quality excellence, and I thank you for your kindness and courtesy to these remarks.

PRESENTATION BY
DR. ALVIN O. GUNNESON
THE GUNNESON GROUP INTERNATIONAL, INC.

QUALITY FOR PRODUCTIVITY:
 AN EXECUTIVE CHALLENGE

Ladies and Gentlemen:

It certainly is a pleasure and an honor to address this distinguished group on a topic of such critical national importance. I believe it is fair to say that the United States is involved in an economic war on a multi-national scope. We are now gearing up to battle for market share while the opposition has been preparing for over a decade. Clearly, gains in the battles of market share are being won on the basis of quality and productivity. As an example, the Japanese have not only formulated a strategy based on the fundamental economics of quality and productivity, but they are also in the advanced stages of its successful implementation. Worse, their alarmingly strident gains in the U.S. and international markets have set an example for "other Japans" who are also vigorously developing export economies.

We are now faced with a situation where our most astute students have become our teachers. It is vital that this situation be reversed, by American leaders understanding the effect of poor quality on productivity and market share, creating the environment for change, organizing the management system to achieve it, implementing the training and initiating the activity to retaliate, with superior strategy, to a situation we cannot ignore. We must be united and dedicated as if we were fighting for our very economic lives, because indeed we are.

UNDERSTANDING THE PRODUCTIVITY RELATIONSHIP

It behooves us to clearly understand quality and productivity and their relationships to each other, for these two factors must be employed if we are to reestablish our position in the marketplace. Toward this end, I am suggesting that quality improvement should be considered as the first step to increased productivity. Quality should also be construed to go beyond the usual considerations of products and services which conform to requirements. Quality should include the correct performance of management, hourly employees, equipment and facilities as well.

It is clear that extensive process automation and facility modernization for productivity is necessary in our nation. This is not advisable, however, until quality, in its broadest interpretation, is a consideration of every action of people who manage and operate existing facilities. An ability to plan, schedule and execute functions without the continuous stream of crises, delays, rework, and inattention to the requirements which now exist, has become a vital necessity for today's management.

Immediate productivity increases can be realized from existing facilities for each management and operator action that is more timely and accurate. Increased productivity will also result from each product and service which does not need to be redone or adjusted. As the quality performance of people improves, there can be substantial capital diverted from unnecessary expenditures which can be used toward the much needed modernization process.

Where facility modernization for increased productivity begins without first improving quality, the inherent deficiencies reduce the ultimate gain. Once proper standards for quality have been attained, processes should be advanced, while maintaining the quality levels achieved. The trend is to do the opposite - expedite the processes, then attempt to reduce the problems, when time permits - of course, it never does! Modernized facilities which are allowed to operate under the conventional attitude for quality, may soon be managed back to the same relative state of dispair and inefficiency which existed before the modernization.

Fortunately, this first phase of increased productivity through quality improvement is relatively inexpensive, because it involves, for the most part, getting those already on the payroll to do what they are being paid to do - their jobs correctly, every time.

Because of its impact on the total economic picture, the need for quality should also be perceived by service-oriented businesses and organizations, for they are not exempt from the present economic squeeze. The attitude often expressed by service organizations, "Our activities are different; we don't manufacture, therefore, quality doesn't apply", demonstrates a misunderstanding of the modern concept. Quality must apply to all organizations, to government agencies, insurance companies, financial institutions, sales organizations, laboratories, utilities, schools and, indeed, wherever people can make mistakes or could perform better. Poor quality costs a great deal of money and adversely affects productivity and image, regardless of the organization. There is not, therefore, an organization or institution which could not or should not profit from quality and productivity improvement. Every organization must envision itself as a troop in an economic army, which must follow the strategy in order to achieve the objective of nationwide economic revitalization.

INCREASING EMPHASIS ON QUALITY

To achieve the quantum improvement needed to win this economic war, executives in the highest offices of the nation's organizations must unite in making quality improvement a national drive. Quality must be a universal corporate objective in every sense of the word. It must be among the objectives of all management reaching through every function and level in the organizations of the country. Quality improvement must be considered in strategic business planning. With this emphasis, quality will become a necessary dimension in the business planning of all organizations, and it will give quality the stature and the attention it must have to achieve the improvement needed.

Emphasis and attention to quality objectives must be followed with a program of individual responsibility for achieving these objectives.

Accountability for quality improvement must extend through all echelons of management in America's organizations, coming to ultimately rest with the Chief Executive Officers of the nation. Today, quality is considered important in many companies, providing it does not interfere with schedules and billing requirements. Altering this attitude will require the creation of organizational environments which cause quality to become a natural consideration for every business activity, ultimately developing quality into a national business culture.

Procedures for quality improvement must be conducted on a formal basis, and they must include all functions of the organization. While departmental improvement projects are quite valuable, they must be a part of a larger, organization-wide quality improvement system.

Personal recognition for quality improvement should not be overlooked as a means of closing the improvement loop and creating a regeneration of the effort.

ATTAINING QUALITY THROUGH PARTICIPATION

Some of our nation's leaders have demonstrated an awareness of the need for quality and productivity improvement. The questions they ask most frequently are, "How can it be obtained?" "Who can I get to do it?" The answer is that quality improvement cannot be obtained - it must be created. Our nation's leaders cannot get someone else to do it, they must see the effort through themselves. They can no longer only support quality, they must participate in achieving it. Skilled assistance with the task is obtainable and recommended, but there is absolutely no substitute for the participation of our nation's leaders in the quality improvement effort.

CREATING THE ENVIRONMENT

Formal quality improvement must begin with the CEOs. Only they can create an attitudinal environment which places a high value on quality and makes it a personal responsibility everyone strives to be recognized for achieving, regardless of their function. There is a direct correlation between what the subordinate perceives as the CEO's emphasis on quality and the improvement which will be realized.

The CEO's position for quality should be clarified and documented in a corporate policy or charter, which should clearly define the stature and role of quality in the corporation. The policy should be more than a few nice words on quality to be stored in a policy book. It should be a working document which establishes the organizational objectives and functional responsibilities for quality. The policy should be used as the authority to begin formal improvement, and as a vehicle for training and orienting employees in the drive to create a culture for quality improvement in the organization.

To instill an attitude of the absolute necessity for quality, CEOs should insist that quality improvement reporting be a regular and equal part of everyone's standard operating reports. Quality reports, often last on

meeting agendas and among miscellaneous considerations, should be more appropriately prioritized. With the same degree of firmness placed on other important aspects of business, the CEO can create further awareness by challenging subordinates for quality improvement. Above all, the most effective tool for quality improvement is the standard and the example set by the CEO, which must never be compromised.

ORGANIZING FOR CREDIBILITY

During the transitional period of attitude adjustments, a heightened image of quality's proper placement in the corporate structure should be created. Unless a proper organizational structure for quality is first established, executive elaboration on the importance of quality may be taken cynically by the operating people. Because the present posture depicts quality as a distant, second-class consideration at best, operating people may perceive the increased emphasis on quality as mostly rhetoric of the times.

Whenever possible, top corporate positions for quality should be established within organizations. While a few companies in America do have this position, most do not. Though not as effective, assignments to staff executives for the added responsibility for quality show progress in this regard.

If quality departments can be organizationally and functionally elevated to a status equal or higher than the departments being evaluated, their effectiveness will be more easily assured. For example, the heads of plant manufacturing, engineering, finance, and marketing will usually have offices in mahogany row with windows, carpeting, and vice president or director titles on the doors. In contrast, the offices of the heads of plant quality are often somewhere out in the factory, without windows or the usual trappings of importance and stature. Seldom will one see a vice president title on the door and the pay grade of the quality heads is sure to be substantially below that of the other department heads. In fact, some quality heads report to other departments' heads as opposed to reporting to higher level management. Under these conditions, there cannot be complete acceptance of the importance of quality by employees, since they put more credence into what they see than what they hear.

TRAINING AND DEVELOPMENT

Training management in the theory and practice of modern quality is essential. It would be prudent for all senior executives to attend an orientation session where they can be briefed on the newest concepts for quality and its role in improving the productivity of all activities of the organization. Then, middle managers should be trained in the use of integrated management quality improvement systems, followed by the training of supervisors on the detail, techniques and application of these systems.

LAUNCHING THE MANAGEMENT SYSTEM

Achieving improvement of the magnitude needed today will require the use of an integrated management systems approach which considers all functions

in an organization's operations. Appointment of a quality improvement operating or steering committee to develop and oversee a formal effort to identify and solve systems problems and counterproductive situations will be necessary. Initially, the steering committee should be composed of a member of management from each operating department. All support departments such as data processing, personnel, and finance should be represented, as well as operating departments like engineering, purchasing, and manufacturing. Because all departments can have counterproductive elements in their operations, they can all contribute to the improvement effort. The representation of sales and marketing on the quality committee is essential. They can identify the problems of the customer environment so that the producing organization may implement remedial action. Field people will also be better prepared to discuss company improvement activity with customers.

The composition of the steering committee should be situation specific. If an organization is having considerable difficulty with quality and productivity, it would be judicious to comprise the steering committee of mostly senior level management, chaired by the organization head. In normal conditions, a balance of senior, middle, and line management may be more desirable. The effectivity of this committee can be maximized by selecting members who have exhibited aggressiveness, creativity and dissatisfaction with the status quo. If large enough, the organization could utilize multiple improvement committees with an executive steering committee composed of the chairpersons of the functional committees and other executives. Besides serving to guide the quality improvement activity, steering committees can serve other useful functions. Fast track employees have an opportunity to perform and be recognized, and individuals have an avenue which provides broader management exposure. Committee service can be a perfect assignment for the constructive malcontent who is always grouching about the ineffectiveness of the company.

Committees should be formed from the management ranks to study the potentially profitable white-collar areas first. As progress is made in the white-collar areas, emphasis should turn to the hourly employment areas. As conditions warrant, selected hourly employees should be rotated on the quality steering committee. At this point, the committee begins to resemble a Japanese quality circle. It will, however, be vastly more productive because it operates with a wider scope and includes an appropriate balance of management and hourly workers.

I stress that while traditional quality circles have proven valuable in some cases, they are premature for many companies in America, and self-limiting by nature of their composition. I believe quality circles are premature because most companies are operating with significant counterproductive situations which are neither in the environment nor under the control of the hourly employee. Although to little avail, many of these counterproductive situations have already been brought to the attention of management over the years, by the outspoken hourly employee. Would it not be insulting to gather hourly workers in circles to identify problems to management which have fallen on deaf ears for so long? Most management teams are aware of the deleterious elements in their organization. Thus, the most prudent first step is to correct - not

reidentify - them. Not until management at least attempts to remedy the known problems do they have a right to expect hourly employees to enthusiastically participate in further improvement. Even at that stage of improvement, a balance of management people on the committee is recommended. Premature use of quality circles is another indicator of management's desire to "cop out," so someone else can participate in improvement, while they conduct business as usual.

EVALUATING THE OPPORTUNITIES FOR IMPROVEMENT

After establishing the committee, the total quality and productivity improvement potential and strategy should be assessed and developed. Care should be taken to assure that the overall opportunity is assessed very early in the program. In their enthusiasm for problem solving, improvement committees are inclined to dash headlong into the activity without first getting thorough visibility of the total task. This is unfortunate because omissions and incorrect priorities result. Further, once the committee delves into the myriad of improvement opportunities, it is unlikely that they will ever take the time to look at the entire picture. A wise strategy for maximizing the productivity of the committee would be to have them trained by someone skilled in the techniques of group problem solving.

The committee experiences the most difficulty when getting started and during potential assessment. Spending a few meetings to identify the overall problems, weaknesses and strengths of the business is a very effective way to begin the assessment. A family tree of counterproductive situations can be developed which will show roots of problems leading to various departments in the organization. These roots provide the basics and the beginning point for department quality teams. The committee functions best as the guiding improvement force and should not be bogged down making all the improvements. Line or department teams should implement most of the line improvements with steering committees improving company-wide systems and guiding line teams. Improvements must be everyone's responsibility.

INTRODUCING THE QUANTIFICATION SYSTEM

Fundamental to every improvement activity is the need to quantify the potential and report the progress. For this task, assistance by the controllers to apply a cost to all counterproductive elements and problem situations in the organization would be desirable. A cost of quality, or more appropriately called, a cost of error measurement system is used very effectively by some companies.

Properly implemented, this system identifies the total costs of poor quality and counterproductivity summing them up to a single cost which can then be reported as a percent of operating costs or sales. The cost of error measurement system is not difficult to implement because the numbers are usually available in various accounting data. The system's value is that it identifies the unnecessary costs from what is generally considered the normal cost of doing business. Cost of error numbers can be used as a tool for establishing corrective action priorities, for justifying the activity and for recognizing employee performance.

If properly measured, this unnecessary cost will be staggering in its enormity. The cost of error in a company which does not have a formal quality improvement activity typically runs from 15 percent to 30 percent of operating costs. A company's cost of error should be 2 percent to 5 percent. A company can realistically expect to reduce operating costs by 25 percent in a period of five to six years.

REWARDING THE EMPLOYEE

Recognition applies in quality improvement activity as it does elsewhere. People simply work better when they are recognized for their effort. Also, at all levels of the organization, recognition for quality improvements should be made and considered in all merit and bonus programs.

Most people understand the effect of productivity on operating cost. Many do not understand, or choose to ignore, the effect of poor quality on productivity and ultimately on profit, particularly on a long-term basis. Executives and line employees will be much more interested in applied quality if it is considered in their merit increases, bonuses and promotions. The more personal the quality improvement effort can be made, the more productive it will be.

IN CLOSING

The activities and concepts described are in use at client organizations and have been proven enormously effective. I was pleased to approve the release of these quality improvement systems to be used in the Harvard Graduate School of Business and other academic institutions in the country. Each concept should be interpreted as a general guide which should be tailored to the individual needs of the organization. The basic rule of quality and productivity improvement effort is that it should be guided by practicality - it must be simple and practical. Improvement effort must not get bogged down in detail and bureaucracy. Most quality improvement teams can keep very busy working on major counter-productive situations for quite some time. This is very much in order, for it is critical that America move rapidly.

Clearly, our demonstrated ability to pivot direction and respond with unsurpassed creativity and speed is our greatest advantage. What was once a threat is now a reality. The challenge is clear - we must each assume a personal responsibility for quality improvement and preserving America as the greatest industrial nation in the world.

Thank you.

PANEL 3 DISCUSSION

Question: I'm Don Couture, Program Manager of Ground Launched Cruise Missile. I'd like to start with a statement that says on the commercial side, poor quality leads to loss in sales, recalls, and warranty costs. Conversely, under government contracts, poor quality leads to increased profit for the manufacturer. He gets to go back and redesign saying "I'm sorry I didn't make it right the first time. I'll redesign that for you. I'll do an Engineering Change Proposal (ECP)." Then we have repair costs; that's more profit for the company. And finally, we have retrofits, which is back where "Well, let's go back and make it right the second time; we'll retrofit the hardware." So, on the commercial side we see poor quality resulting in loss of sales, loss of business and loss of profit. On the military side, we see poor quality leading to increased business which, in turn, leads to increased profits. What can I, as a program manager, do to reduce poor quality, to get things back on track where the guy wants to deliver, wants to make less profit by making it right? Who'd like to touch that one?

Answer: (Dr. Juran) I think that if you look at the history of a number of programs, we've had government contractors who lost their sole source situations due to poor quality. In the commercial world you have the reverse. Our companies that are suppliers to the automobile industry, the OEM automobile companies, are not able to make money selling them. They make money on the spare parts which is very profitable. It also gives them a vested interest in quality failures and they are very uncomfortable about that. Somebody comes along and finds ways of making things that don't fail. Loss of 20% of the market to invasions from abroad is one of the results. But I think you will find that both things are present in both those worlds, the antidotes competitively are very similar.

Answer: (Mr. Augustine) I do think that one of the things that could be done and be done very effectively is to place major incentives on the contractor's ability to pass a reliability test. In cases where I've seen that done, contractors take it seriously. But if the only thing you incentivize is the schedule or cost, the contractor is going to think that's the only thing we care about.

Answer: (Mr. Weisz) I would like to take issue with that statement; You're speaking in generalities and I don't know of any contract that my company has ever been involved in, in which we had problems and made more money on it. We've lost our shirts! I think the fact that you think we make more money is a serious problem. Now I don't for one moment say that there aren't situations where people do end up with having a situation of reimbursement and make more profits.

Statement: (Dr. Feigenbaum) I think it takes some of these things a while to work through. When you compare the fact that in this country, years ago, the typical household refrigerator would have a life cycle cost of about 5% and the typical television, a life cycle possibly of 35%. That may very well have been one of the reasons for the different consequences we see in those two product markets. Today the household refrigerator has held up reasonably well in terms of its usage in American kitchens. Televisions have had a significant amount of outside competition. It took a significant period of time for that to work through to the user consciousness and the decision making as to which products were going to be used.

Statement: (Mr. Burchfield) When we talk about the cost of quality, we are talking about cost of error. We've been using the cost of quality for so many years and it has been in error, when we say cost of quality and we mean the cost of rework or the cost of repairs. I think it's time that we all identified the cost of error for what it is. We talked about this on the National Advisory Council last year—it's time people called it what it is, cost of error.

Statement: (Dr. Hunter) I don't know whether it's cost of error so much as is it our objective to do a better job. If we sit back passively and watch what we do, the errors will pile up and perhaps we can learn from our errors. But the objective is to do a better job, to somehow project a better performance, and learn more by what we're doing. We are in a learning situation as opposed to a monitoring situation, largely. What are we doing to learn more about the systems that we are manufacturing and their performance?

Statement: (Dr. Gunneson) I agree with the cost of error. The important thing is using the word error, because if you use cost of quality, people tend to confuse that with cost of quality in the department. They say "Gee, it's costing me quite a bit. What do you mean it's free, I pay the bills." But if you use cost of error, it's clear. But what happens if you use cost of error—it's negative there too, because you can't get managers to put that number off, they just don't want to see 20%, 25% cost of error displayed on a board somewhere because that looks like they are not managing too well. So both have a problem, but if I have a choice, I'll use the cost of error.

Statement: (Dr. Hunter) In a certain way, you can look at this as a systems thing. You are looking at the investment for what you get, and what we look at with respect to the cost of error. However we describe it, it is the kind of thing that you want to get. We also have to emphasize what you need to put in at the front end. I think our big requirement today is to continue to emphasize investment in front-ending quality programs and reliability programs rather than minimize the front-ending requirement in favor of control only. We have to spend money and get the returns from it at both ends.

Statement: (Dr. Gunneson) One final comment on cost of error. Scrap and rework are probably the smallest element. If you could measure the cost of design errors, the cost of improper or inadequate management decisions, and the cost of marketing, it would go way beyond the 20 or 30%.

Question: (John Rittenhouse, RCA) In the defense area, I think the problem of the fellow down at the floor is in many ways significantly different in the commercial area. You commented on getting on with the use of some more modern statistical tools since 1983. My question is, do you see anything that offers us significant help in very small production runs; for instance, building ten weapons systems a year.

Answer: (Dr. Hunter) Yes, people make the mistake of thinking that because the standard gives you the statistic and involves large masses of numbers or large numbers of products, somehow or other, the statistics therefore have nothing to contribute to the problem where a person is going to manufacture ten things in one year's time. However, when you manufacture those ten things, there is some very severe design problems which come along. And there are alternative design suggestions. What are you doing aggressively to decide on which of the two or three design modes is best for your particular product. It's time we started applying statistics before the production. How many you produce is not the important question. There are multifactors involved in designing a system. Interestingly, the Japanese have just come out with a classical experimental design called the Orthogonal Arrays. They're showing the modern applications of statistics at the design stage, mind you, not at the manufacturing stage. Interestingly, at the design stage they find those factors or combination of factors that have the greatest impact on the system response and find those factors which have little impact on the system response. On the factors that have little impact, they reduce the tolerances and therefore their costs. And so there is plenty to do with modern statistics, even though you are turning out ten items a year.

Question: (Dr. Stimson) Several panelists have talked about better supplier relations and about a trend of fewer suppliers developing a better relationship. I will hypothesize that those on Capitol Hill might view that as further restriction of competition. We already have considerable problems in that area and are criticized for not having more competition, particularly in spares. I wonder if anybody could comment on how that trade-off might be better handled?

Answer: (Dr. Juran) I think there is need to act in single file and not on a massive front. To conduct an experiment, to demonstrate, we go at this in terms of fewer suppliers or some other more collaborated basis and here are the results we have gotten. Let me give you an example. This was told to me by one of the general managers in the Philips Company, a huge Dutch electronics company. He presides over the components division and he sells primarily to his own sister divisions. The experiment he conducted dealt with buying plastic moldings. So he told this supplier,

"You've got this contract, no bidding. You've got this contract, you've got that contract, come on in, we are going to show you how we are going to use this thing, how we are going to test it, the environment it has to survive under, fitness for use, not conformance with specifications." We ended up with one and a quarter rounds of samples needed to get the final results instead of three. That's a useful deduction in time and then, as to cost, he faced his purchasing managers down. Their concern was, "we'll have to have higher prices because these fellows come at us with negotiated prices rather than bidding the lowest price. His reaction was, we have people that understand that business. We make these things. If somebody comes in with an estimate that looks to us to be out of line, we'll tell him, let's see your breakdown and we look at the individual numbers and you'll call it out." That's an experiment. And having gone through that, he's comfortable. He's going to make some mid-course correction, and he's going to expand that; but that would be the logical approach. I don't see how....without that kind of information of a tested result, I think you have enough power to make an experiment, but until you have results like that, I would suspect that you'd have trouble trying to convince people like the people on the Hill. You wouldn't be able to put them on the defensive.

Answer: (Dr. Hunter) I think that the reduction of suppliers on the commercial side is by no means on an across-the-board basis either. It too has been gradual. Based on what was talked about this morning, development of experience and relationships, and recognizing that in the final analysis, a supplier situation is an investment on both sides, and one of the most difficult problems that exists from a quality point of view is to be able to prove the point unless you have enough long term experience to be able to work with it. So while there has been a great deal of public attention to the reduction of suppliers on the commercial side, I think that when you actually look at the facts of the matter this has been a very step-by-step, by no means across-the-board, fireworks display; very systematic, very careful.

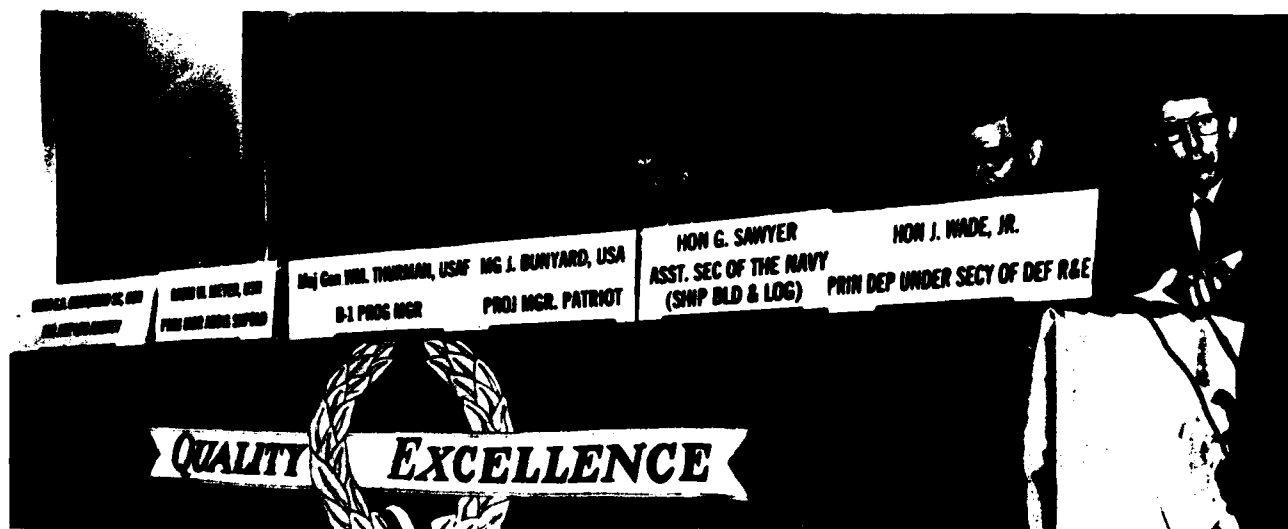
Answer: (Dr. Gunneson) I have been involved in quite a few supplier programs for major companies and one of the things I have learned is that a supplier will never, ever be reduced from the group if they present error free products. If you deliver error free products, you are going to be a supplier for as long as your customer is in business, and I think anyone that is worried about restraint of trade, restraint of competition, ought to be directing their worries and energies towards error free factory products, and then they won't have to worry at all about that reduction.



PANEL IV

BOTTOM LINE II CONFERENCE

1 JUNE 1983



PROGRAM MANAGEMENT AND PROCUREMENT IN DOD

MODERATOR: HONORABLE JAMES P. WADE, PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (RESEARCH AND ENGINEERING)

MEMBERS: HONORABLE GEORGE A. SAWYER, THE ASSISTANT SECRETARY OF THE NAVY (SHIPBUILDING AND LOGISTICS)
VICE ADMIRAL E. A. GRINSTEAD, SC, USN, DIRECTOR, DEFENSE LOGISTICS AGENCY
MAJOR GENERAL JERRY BUNYARD, USA, PATRIOT PROJECT MANAGER
MAJOR GENERAL WILLIAM THURMAN, USAF, B-1 PROGRAM MANAGER
REAR ADMIRAL WAYNE E. MEYER, USN, PROJECT MANAGER, AEGIS SHIPBUILDING

QUALITY - THE VITAL LINK

PRESENTATION BY
THE HONORABLE JAMES P. WADE, JR.
PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE,
RESEARCH AND ENGINEERING

Thank you Frank. Good afternoon Ladies and Gentlemen. The advantage of the last panel of a conference, is that we have the benefit of all the foregoing discussions and can adjust our comments accordingly. It is heartening to hear the appreciation for Quality, the concerns expressed by the various DoD users, industry representatives and the professional Quality community. This is not to imply that the preceeding groups are opposing camps, but rather family members striving for the same goals, but with natural differences in their own perspective. The Program Management and Procurement panel represents another family member. The individuals here are high visibility members of the acquisition community and their systems have been designated for program management or they are key overall managers.

The objective of this panel is to delve into the various resource and time constraints that face procurement and program management. Now we are concerned here in the Department of Defense about reports and the perception that the Quality of U.S. products have fallen behind the products of other countries. We are concerned together about productivity in the Nation as well as in the Defense Industry. Not only must the armed forces and our defenses be strong, but we must be strong economically to withstand outside threats to the Nation. We are not raising here anything new because each of you here today will appreciate this fact, but the implication of this trend for our Nation's defense is indeed serious. An efficient defense industry with its underlying industrial base is the key to DoD's ability to supply qualitatively superior airplanes, missiles, armament and electrical systems into the hands of the operational people who stand ready to defend our freedom. Qualitative superiority over the Soviet Union and Quality equipment go hand in hand. Let's keep this important correlation up front and not forget it. Now to achieve Quality, we must emphasize Quality from the highest levels. This emphasis must come from top management, the Chief Executive Officers, and Quality must be stressed to all management levels right down to the person doing the job. In the past, top management in the United States, both government and in industry has given insufficient priority to Quality, Reliability and as important, Maintainability. We have talked a good story about supporting these areas, but in the main, only if it didn't get in the way of cost and schedule. Management has made and in many cases, is continuing to make short term decisions shunning the up front costs and sacrificing the long term payoff of Quality, maintainability and reliability.

Now to address those important subjects in some detail this afternoon, we have with us five experts to my right in procurement management within the Department of Defense. Now let me match faces to their own placecard in front of them. To my right, is the Honorable George Sawyer, who is the Assistant Secretary of the Navy for Shipbuilding and Logistics, and to his right is Major

General Jerry Bunyard, USA, who is currently the program manager of the important Patriot Missile System; to his right, Major General Bill Thurman, USAF, Program Manager for the important B-1 program; and to his right RADM Wayne Meyer, the ramrod for the AEGIS Shipbuilding Program and finally, bringing up the rear and trying to cover all the pieces in front of us, is Vice Admiral Grinstead, currently the Director DLA. So we turn the floor over to George—

PRESENTATION BY
THE HONORABLE GEORGE A. SAWYER
ASSISTANT SECRETARY OF THE NAVY
(SHIPBUILDING AND LOGISTICS)

Thank you Jim. Good afternoon ladies and gentlemen. I am pleased to have these few minutes to address a new government initiative, the Industrial Modernization Improvement Program or IMIP, as it relates to the Quality of weapons systems and more generally, to national defense preparedness. Now, it is certainly a truism that a manager must know what business he or she is in. Business schools teach the concept, and popular books such as MEGATRENDS and IN SEARCH OF EXCELLENCE, reiterate it. Similarly, it is important that leaders of the defense establishment in government and executives in defense industries have at least a conceptual knowledge of each others business. Therein lies the basic value of this Bottom Line Conference: To better understand our own and each other's goals and to create the means to fulfill our requirements in a mutually supportive way. We all understand that the relationship between DOD and Defense contractors must be businesslike and at arms length. At the same time, it certainly does not require an acrimonious relationship. Rather, it demands that the leaders of both the government and private sector work to serve their respective roles to the American taxpayer and stockholder while meeting the common objective of a sound National Defense. The broad mission of the defense establishment is protection and support of the National interest through an integrated strategy and also through the maintenance of the state of preparedness to execute that strategy. Hopefully, the integration of the vast number of elements that make up our defense establishment rationally recognize and prioritize each one. This integration effort must include not only government resources, but also a realization of the indispensable underpinning provided by you in American Industry.

The Navy, like all the Department of Defense, places great reliance on the Nation's privately owned and manned industrial resources. All new ship construction is accomplished in private shipyards and approximately 1/3 of ship repair and overhaul work is contracted out. The production of aircraft and weapons systems is virtually all under contract. In a recent contract for the Maritime mobilization force, we recognized that our requirements was not the procurement of ships, but the need for a service to transport and hold prepositioned equipment. As a result, the Navy contracted out for that service, with the private sector purchasing and converting ships to Navy requirements and providing the service wherever and whenever needed. Such reliance requires an extraordinary interaction between government and industry to insure maintenance of a modern, sound, efficient, cost effective source of industrial goods. Now, there is a growing awareness and even alarm among the general public, and particularly in the Congress, regarding the state of our own Nation's industrial capability. We are finding ourselves noncompetitive in many industrial markets which were previously dominated by our industry in terms of technology, quality and price. Shortages of engineers and highly skilled technicians -- indeed, shortages of the very teachers we need to produce these skilled people -- and outmoded production facilities are among the problems that must be confronted now. It is time for action. Government and industry must forge a relationship that sustains our separate bottom-line needs, while also recognizing and meeting the needs of others. Private

industry's bottom line is profit. We in government must incentivize industry through profit to produce the quality and reliability that we demand in weapons systems and to maintain the modern industrial mobilization base essential to sustain National strategic objectives.

You in industry must invest in improved plant and capital goods. Simplistically stated, we cannot maintain a sound defense posture on an industrial base producing new breakfast cereals, video games, fast food, and legal services. Inherent in the need for improved industrial capability is the need to demonstrate to our allies and adversaries alike that we have the resolve to support our national interest and international commitments, plus the industrial means to enforce this resolve over a prolonged period. In November of last year, then Deputy Secretary of Defense Carlucci authorized a test of the DoD Industrial Modernization Improvement Program, IMIP, as it is called. It was developed by a tri-service committee under Navy leadership to create a means to incentivize industry to make productivity enhancing investments. IMIP was thoroughly reviewed within the Department; and industry comments and suggestions have been considered and included. IMIP is not a new generation, stand-alone program, but rather builds upon and expands some of the successful service initiatives in technology modernization and prior industrial productivity improvement programs.

Conceptionally, it is based upon the modernization needs of an entire production facility, not just a particular production line. Contractor investments in real property, capital equipment and technologically advanced concepts which improve productivity and quality and, at the same time, cost competitiveness; these are the fundamental objectives of IMIP. It is not strictly a capital investment program, but also emphasizes productivity enhancements to all facets of manufacturing processes including such areas as materials, overhead, support and organization. There are two principle incentives for the contractor: first, shared productivity savings, which provide the contractor with an equitable share of the program savings; that is, the cost reductions resulting from enhanced productivity. This is a true incentive recognizing the value of contractor investment. It does not penalize productivity enhancing investments by demanding price reductions which consider only reductions in contractor costs, while disregarding his investment that made the cost reduction possible. That second is contractor investment protection against terminations. This provision permits the government to compensate the contractor for the undepreciated part of his capital asset investment in the unlikely event of the premature termination of the production program. Previous restrictions in the Defense Acquisition Regulations or DAR which required that assets afforded investment protection be severable have been waived, thus, permitting real property to be a component of the investment analysis. Pass through via IMIP provisions to subcontractors is also an important part of this program. It is possible for a prime contractor to initiate a comprehensive IMIP program with its principle supplier base. The resultant productivity would be shared fairly and, if necessary, with the government providing contractor investment protection.

The IMIP test is now being implemented. Successful execution requires detailed analysis by the companies submitting a proposal, but the potential rewards to individual companies should be indeed great. Further, the potential of IMIP to

incentivize major improvements in our defense industrial capability as a Nation in terms of improving productivity, decreasing the cost of weapons systems and improving product quality is substantial. It will provide government and industry with a much needed vehicle with which to forge a businesslike partnership in which industrial capability is improved and the cost and rewards are justly shared.

Now, a number of IMIP proposals have been received to date from industry and are under consideration. Each agreement and/or contract will depend upon the details of that specific proposal. Today, proposals from Grumman and Thiokol are currently under detailed reviewed and, hopefully, will result by the end of this year in the first two IMIP contracts under the DEPSECDEF authorized test. With that my limited time has about ended.

In conclusion, I would like to stress that the decisions we make in the near future, whether in industry or as a government will have far reaching effects. It is critical that we assume a farseeing posture and insure that our actions genuinely serve a long term national interest and result in a revitalized and, hopefully, maintainable defense industrial base.

Thank you for your attention.

PRESENTATION BY
VICE ADMIRAL W. A. GRINSTEAD, SC, USN
DIRECTOR, DEFENSE LOGISTICS AGENCY

First let me start by saying most of the people who have been talking to you today are engineers, project managers, profit watchers, while I have been a logistician for 40 years, and I have had to please all these people including this crowd right here on the platform and some of those down there in the audience. They are tough boys to please. If you look at the whole logistics picture, the first thing you face is readiness, and the minute the operator does not have what he wants, he's raising a storm. The next thing you face, is why don't we have enough spares and you start looking at the process and you find out that somebody told you this one is going to last 1,000 hours, so you calculate out so many operating hours "in the air or on the sea." When you buy a specific number of spares and then you wake up and find out down the line the thing is operating at 150 hours instead of 1,000 hours, you are in trouble. Many of the components are at 25 and 35 hours performance for a couple of years before you get some improvements incorporated. You can also look behind the scene and you see a huge shortage of money because you didn't know the poor performance was going to happen. You have to go back to fight on the Hill, the Congress and the rest of the budget world. With all of these conditions multiplying, you see let's say on a carrier today - a 100 million dollars worth of spares. Beyond that you see huge shipyards, aircraft overhaul points, very expensive transportation, a lots of training for people - never enough - and yes I would say to you - that if you give us collectively together a 10, 15% improvement in Q, the savings are in the billions.

Now as I have listened through the day - I would like to tick off a few things that I was impressed with. You are impressed with some things while I am impressed with others. The first thing that nobody can deny - is that whatever you are using, be it the rifle or a missile - with the speed at which things happen today, the item must work the first time or the shoot-out may be over if it fails. As I listen to the industry - there were some things I really like to hear and they have stuck with me. There are some of you out there that really have your hand on the till. The ones that showed me an appreciation for the role of the worker - the one that is willing to listen to him to make him feel important - to motivate him - give him some incentive - give some pride, I have a theory that says people only give you what you demand and if you don't demand the best, you are not going to get it. We talked about communication, now there is nobody, in spite of all these service gents and their problems, there is nobody who has to communicate more than I do with the Hill. DLA has 300,000 contracts. So every time somebody doesn't want to be terminated for default or we are not going to award to him because we didn't think he could do it, we end up writing a lot of letters, we go see a lot of Congressmen. We deal with some good contractors and we deal with a some questionable contractors. In any case, the issue of communication is most important, when you look anybody in the eye, you more often than not can settle the issue. I hope that we keep learning to do better. If we look at each other in the eye and work together that includes the PMs, procurement officers, administrative contract management officers, QARs, the whole match I think we can resolve anything.

Another thing that impressed me is that I have been watching the Government try to work out what people call innovative contracting for years. We talk about things like warranty free contract incentives, penalties, but it takes us years to really do anything new.

Now, let me tell you why DLA is interested. We are the administrator for 300 thousand contracts primarily let by the Services. Those 300 thousand contracts have been awarded to about 22 thousand different contractors, and we have about 5000 QARs to oversee that work. It is obvious that we cannot do the job in great detail. But it is obvious that it is your responsibility and the bottom line of that is to get the Quality in at the prime and at the subcontractor level. To me, the main feature here is your integrity, and when all have integrity the job is easy for all of us. We do some other things for the services -- we do preaward surveys, frequently we report the contractors financing or his engineering, or his productive process are inadequate and we do not think he can handle the job. Often we are overruled. Sometimes, we report the contractor is overloaded -- don't give him any more, we are often overruled. Sometimes we make that problem for ourselves. Frequently the service is brought in on the Quality systems review at the contractors plant. We take the PCO, and the PM in with us to go through the process and, we write up a deficiency report. We go back -- months later and we find the contractor has not corrected the problems and invariably somewhere down the line, you and we pay for it.

Let me summarize by giving you about three points that I think are important and where you might help us. I believe that maybe you can help us more than we can help ourselves. First, is this education issue. I think it is obvious that we have not been educated to work the Quality problem. You rarely find it in universities - Dr. Hunter, talked to the issue, but if you go back and look at the business schools, or the engineering schools, you will find very little that contributes to Quality in the big production environment that you are in. I'm sure you spend a lot of money helping the universities, maybe some Quality Chairs in the university system will generate some interest.

The next item concern contracting techniques and I suspect you in industry are smarter than we are in Government. Maybe your association should be proposing to the government better contracting techniques - the type that give you flexibility, that give the incentives and motivation both for developing facilities and people. Now I like the Motorola thought -- if you pay the people they will give payback to you either in Productivity or Quality, and the quality is a very big one.

As you read the papers today, the Congress, the press and taxpayers are all very concerned about the job we are collectively doing - they are concerned about competition, small business, disadvantaged business, the price growth issue. I can tell you, in my opinion, you have not seen the tip of the iceberg. Every committee on the hill wants to get its fingers into this competition issue. They question DoD contracting techniques, there is a big issue coming up on data rights; and Congress talks about the Quality of the weapons that you are producing and we are fielding and operating. If there is any way that you

in industry can motivate - the Congress, - or specifically the House Armed Services Committees to set up a special subcommittee to oversee the Quality, productivity and the contracting techniques, the data rights issues, where we might develop some expertise on the hill, we would all be well served. Today, everybody is a semi-expert, everybody has got his finger in the pot, and I would suggest to you, that if you can lay on the pressure to create a subcommittee to become the major oversight on the problem we have discussed, we can make some real headway for DoD and our nation.

Thank you very much sir.

PRESENTATION BY
MAJOR GENERAL JERRY BUNYARD, USA
PATRIOT PROJECT MANAGER

Today, we have heard from the user; we have heard from industry; we have heard the professional outlook by distinct panels of industry, and I think that all panels that we have heard today have very eloquently expressed their desires, their concerns, and some recommended changes in the way of doing business, especially as it pertains to the Quality Assurance program. I was reminded all during the conference today, of that sign that was located in President Truman's office, wherein it stated "The Buck Stops Here", and this comment is certainly appropriate to the program manager's role in respect to all aspects of weapons systems acquisition, not only the development, the production, the fielding and sustainability of that system and certainly all of these aspects weapons systems acquisition process certainly must have Quality as the top priority.

I have been asked to comment on two specific areas in respect to the weapons systems acquisition process: one of which was how did we, in Patriot, establish our Quality Assurance program, really what does it consist of and what are the results. The second aspect that I will discuss today pertains to the question, why are defense costs underestimated?

As you recall General Richardson's comments this morning, one of the users, many of the questions that he raised at that point in time I will attempt to address as we go through this.

Quality is the result of a focused effort and attention during program planning, design and manufacture - Quality Assurance is a planned and systematically executed action necessary to provide a high degree of confidence that all established technical requirements have been met and satisfactory performance is assured.

The Quality of a fielded system is only as good as the Quality Assurance program that has been established for the system and the implementation of the program within the project and at the contractor's plant. Quality must be the central issue from program initiation through the production and deployment phase of the life cycle and must be placed at the top of the list of priority from the lowest level of manufacture through final assembly. The magnitude of the challenge can be illustrated as follows: each time a Patriot weapons system is delivered to the user, it represents over one million piece parts that are manufactured, one piece at a time, assembled and tested to perform its criteria on a production line made up of thousands of special tools, special process procedures and hundreds of pieces of special test equipment specifically designed to meet the acceptance criteria of the system. The system has miles of wire and over two million solder joints that connect the system together to operate as a single unit. Our Quality Assurance programs must reasonably assure that each component is in the right place, each wire is at the right terminal point and each solder joint is properly formed so that all objectives will be met when the switches are thrown and the final button is pushed.

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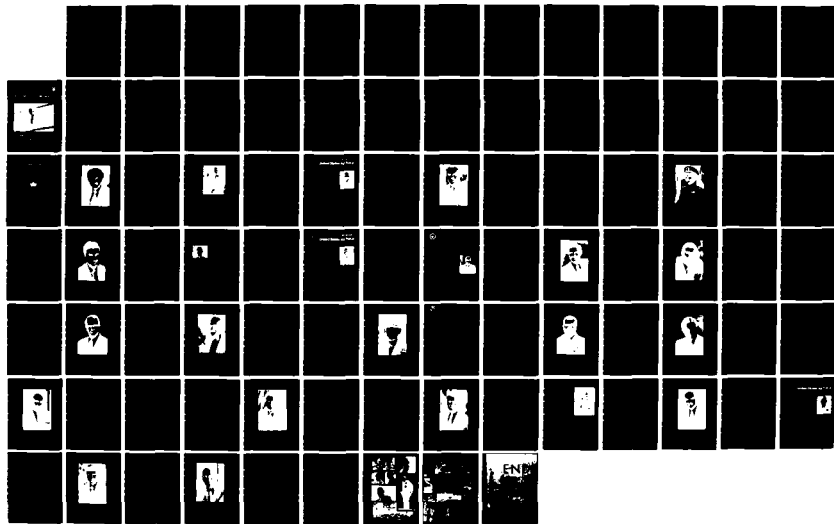
BOTTOM LINE II CONFERENCE QUALITY -- THE VITAL LINK IN
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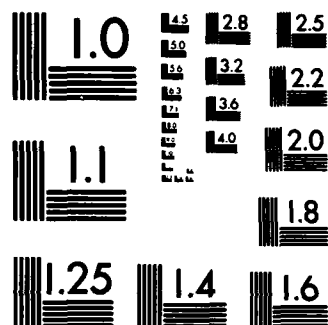
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Quality planning has been an integral part of the Patriot system's activities beginning with the initial requirements and continuing to the present time. Quality plans and production plans were generated in advance development and updated in engineering development. The Patriot producibility, engineering and planning our PEP program was developed to insure an orderly transition from development to production and result in a cost effective weapons system that considered all matters of producibility and reliability three years in advance of actual production operation. Intensive managing and monitoring of the Patriot PEP program has been performed to insure that the Patriot Weapon system is fully producible and is designed so that economical, repeatable and reliable production may be accomplished. PEP activities include the development of manufacturing data package, the design of the special tooling and special test equipment and product assurance activities.

The Patriot initial production activities, our IPF program provided production hard tooling and production line set up to support rate production. The overall objective of the IPF phase was to manufacture sophisticated and automated special tools, special test equipment that was designed and documented during the PEP phase of the Patriot Program.

Now the real challenge in the transition from development to production involves a new way of thinking for both the contractor and government personnel. The design of a major production program with its inherent Quality implications is as exacting as the design of the product itself. A system as complex as Patriot with its thousands of manufacturing processes, procedures, operations, tests, inspections, vendors and subcontractors required getting away from the thinking about hand build hardware and considering automated production, where because of rate, each ineffective and inefficient operation is magnified in cost over and over again. This thinking involves transitioning from low quantity, high unit cost hardware to high quality, low unit cost hardware produced as a repetitive basis yielding high reliability parts and components.

Quality and reliability have always been the major objective of all Patriot production efforts. The system is extremely complex in the equipment it contains and the functions that the equipment performs, but the system is manufactured one piece at a time starting with the basic raw material. To insure reliability during the actual production process, we elected to control inspection or test points utilizing appropriate test procedures at test stations. The major challenge was to control the right test stations to allow for insured reliability and yet allow the contractor the required flexibility needed for production. If we controlled all the stations, we would have a greater control on reliability, but the cost would be prohibitive. If we controlled none of them, the cost would be less, but we would have no control on reliability. So we balance this requirement for cost, reliability and flexibility by electing to control test stations at the battery replaceable unit level.

This reliability in Quality concept can be illustrated by our missile production process. During production, incoming parts are inspected by x-ray, burning in, environmental testing and so forth to screen out the marginal

components and assemblies as well as infant mortality related failures. These tests are performed prior to fabrication and assembly as a reliability function. As fabrication and assembly begins, the components are assembled into modules and the production flow continues through subassembly, assembly section and complete end item.

Special test stations are established at each of the separate levels. There will be a total of 217 government controlled test stations used in the production process. We have 138 of these in the missile stations and 79 in the ground stations. The equipment operating instructions and software for each station are controlled by the government. DCAS is tasked to monitor each test station during production to assure the accuracy and the adequacy of the test results. During early production, project office technical representatives will also monitor the test stations to insure system requirements are met. Now as I stated earlier, the major consideration we had to make involved controlling the right test stations to allow for insured reliability and yet allow the contractor the required flexibility needed for production.

The results of our Quality efforts are illustrated by comparing the missile faults encountered during the engineering development build versus the faults occurring during the first production build. Each test level is decreasing in the number of faults and we are approaching our quality goal of two faults per system. In addition, we have implemented ongoing quality actions to insure our goals are met. These include, in fact, some of the recommendations made by panel members today. Our plant Quality Chief reports directly to the plant manager. Government and contractor teams have been established to determine short and long term corrective action of quality and manufacturing deficiencies. Emphasis within the plant on quality has been at both the management and worker levels. We have incorporated training, manufacturing aids, quality circles, audits, added inspection and we have also included a new integrated quality data system. Now these are terminals that will be provided in selected production areas. They will provide automated reports and detailed data for corrective action.

Now if I may shift to my second subject, and that has to do with why are defense hardware costs underestimated, the program that has been carefully designed and undertaken in stages to establish the most effective, efficient and reliable program possible. The program has been achieved by implementing manpower and equipment. The incremental application of manpower and equipment allows the initial Patriot production rate to increase as a step function utilizing learning, dedicated tooling and test equipment and repetitive operations to build up to the cost effective production rate and high reliability program. But many times, hardware costs are underestimated when production is finally begun. One of the major reasons for this, is that the complexity of the program is often underestimated. There is a reliance on past production methods and the concept of "we always did it this way" in the plant and this can lead to many first time thru production problems that cause considerable work arounds.

Requirement charges also add to cost. Systems initially required to have four launches per unit may be increased to six or eight. Design charges made as a system in the various stages of development and production cause the cost to grow. Many of these are necessary, but they are beyond the ability of the production facility to be directly controlled.

Another major cost driver, and this was brought up today, for the underestimates of additional hardware costs, is the instability of the production program. A complex system with thousands of manufacturing processes, procedures, operations, tests and inspections, vendors and subcontractors cannot become unbalanced or produced at less than its design to rate without encountering cost impacts created by ineffective and inefficient operations and reliability impacts caused by the same operation. Stated simply, if a man is hired to operate a machine that's designed to produce ten widgets and the requirement for widgets is cut back to three, we have a 70% nonutilization of man and machine. A loss of learning from producing a less than a design to rate, and a less reliable product due to increased scrap rate and rework.

Many times initial cost estimates are optimistic instead of realistic. This is caused in part by the contractors desire to win the contract and the previously mentioned fact that the complexity of the program is often underestimated. This results in the cost per increment of improvement rising much faster than improvement. Inflation causes a substantial and continuing rise in the general price level of hardware. It is a very difficult item to control or estimate in advance and many times the rise in costs caused by inflation is so great that it offsets the gains made in productivity and learning.

Finally, because it is the last major step to occur, the support of the system is impacted by all of the issues above and thus is usually underestimated. The complexity, changes, instability, optimistic costs and inflation all have a major impact on the overall support of the system and all of these costs are related to and are, an overall part of the continuing quality effort.

In conclusion, Quality must be a major consideration in the transition through development and production. Quality must be the driving factor; not schedule and costs. Whether the program is in engineering development with a mad scientist or IPF with the gadgeteers, quality products must be the name of the game plan. If not, we may find that the stuckees in the production are having to answer questions that no one has been asking. Thank you.

PRESENTATION BY
MAJOR GENERAL WILLIAM THURMAN, USAF
B-1 PROGRAM MANAGER

Thank you Dr. Wade - Distinguished panel members, outstanding conferees... I regret that we couldn't hear from more of you who represent far more expertise than I - certainly on this most important subject. We in the B-1 are committed to providing a quality product, that is affordable and supportable.

Someone asked Martina Navratilova if she was involved in tennis, and she said I am not involved - I am committed. The guy said what's the difference, and she said, I had breakfast this morning of eggs and ham. Drawing the analogy, she said the chicken was involved... the pig was committed.

We see ourselves as totally committed in the B-1 program. But rather than trying to talk about all the aspects of the program that involve quality and the things that we are trying to do in the program to assure high quality and affordability within the B-1 program, we selected just three areas we would like to talk about in some depth because we think that this would be of interest to virtually all of the conferees here. The chart shows the subjects.

The first place, the way we have organized the program office is unique. The program has some very specific direction. We were directed to produce 100 aircraft and their support within a 20.5 billion dollar ceiling. Because of high interest in the program, we were tasked to make periodic reports to the Secretary of Defense. We are still doing that. There are some things that are in program and within the 20.5 billion dollars including logistics and multi-year because of the savings. The basic design of the system is frozen and our job is to provide the capability the Air Force has asked for within that 20.5 billion dollars. You notice, there are some exclusions which everybody understands up front. To structure such a program that would provide the aircraft on the schedule and within the cost, we structured a fully concurrent program. We are doing the remainder of the development program started in the B-1A Program. Virtually all of the air vehicle was the development of the original B-1 program. All of the avionics for the aircraft are not new to the AF, but new to the B-1. We started the production on the same day we started development. We already have underway our flight test program. One very important element of the program missing from this chart, is the logistics support. That is very much a part of us and I will talk about that in the third subject of the day.

We have structured our organization in a fairly unique way. At least unique for the aircraft world, although I recognize that this is typically done with associate contractors on the space side of the AF. We have four associate contracts with the companies which you see listed on the chart. They perform that element of the program. The AF has assumed the responsibility as the general contractor for integrating all aspects of the program. As a consequence, we have assumed the risk of that integration. We are working with the contractors to assure that this weapons systems provides us the capability required. We don't contract with the subcontractors as the chart might imply. Rather we work through the prime contractors and we deal very closely with about

65 of the key subcontractors that work for these associate contractors. Some 5200 subcontractors currently support the B-1 Program. This SPO itself is a nerve center. We deal with the organizations that you see on the right hand side of the chart as you might imagine. We are also very closely involved in nuclear certifications and weapons safety criteria with the organizations on the left hand side of the chart, including the Congress and with NASA. NASA performs some of the critical wind testing for us. Of course, we deal with our associate contractors and through them the subcontractors. Now how do we make this integration process work so that we can assure that we have a quality product? All of our associate contractors are tied together with interface control documents and associate contractor agreements. You will notice that each of them has an agreement with each other and all have agreements with the AF. We have only one total system performance responsibility agreement. Rockwell has responsibility for the installed performance of the General Electric Engine. We also use engine management from the propulsion SPO. Our simulator program which that has not initiated, will be managed out of a simulator SPO. They both tie in very closely integrated to the B-1 SPO. We are using some management techniques that we believe will help us get the decisions that are required on the program to keep it on schedule and make those critical decisions or those compromises that have to be made in the development process to assure that we have the performance in the system that is required. We use team work and emphasize that very heavily, not only within government team, but also between government and contractor. We have delegated an awful lot of responsibilities to our plant representatives from the Defense Logistics Agency and the Air Force Contract Management Division, far more than is typical. We want to put responsibility in the hands of the people that can discharge that responsibility best.

The whole team serves as a cross check, both interteam and intrateam, so that we can understand the problems that one team member is having and perhaps find ways that other team members can help those guys get out of trouble. We are doing some things which we think can minimize cost as are indicated on the bottom of the chart. Formal schedule management reviews go up to the Chief Executive Officers of four associate contractors on a quarterly basis. We will hold the 12th & 13th of June, the next (6th) of those meetings with the CEOs of our four associate contractors. One very important point is we all share the same data base and we have in the program the ability to tie together our computers so all of the data is available to each of the contractors. We manage them from that same set of data. That helps us, we then make the decisions we need to assure a quality product. Let me talk about two very important aspects of our program. The first of these, is the direction that we have received for multi-year. You see the direction is written on the chart. We were to proceed with a multi-year program, in order to achieve 800 million dollars worth of savings. The program that we have signed up for is a 20.5 billion dollar program. If Congress doesn't approve the multi-year, ostensibly, the price should go up some 800 million dollars. We have already taken out that savings up front. Lets talk about these three aspects of the multi-year program since we are in the midst of that multiyear program and receiving Congressional approval. These are some observations that we think are pertinent to multi-year at this point in the program and I will talk on each of these. In the current environment, we don't believe that the Congress really favors multi-year programs. There have above some 14 multi-year

candidates for FY 84 only six of the 14 made the House Armed Services Committee cut. The Air Force submitted four of those multi-year programs and only the B-1 is alive today. B-1B multi-year is not in the House Appropriations Bill, but, it's in the Senate Appropriations Bill and it is past the Senate Armed Services Committee.

Some of the criticism of the multi-year approval process, is that it takes approximately 75-100 briefings. We don't have a lot of experience with multi-year in the air Force so this is based on ALCM and F-16 experience and now B-1. The F-16 took about two years for their approval and about 100 briefings. We are beginning the process and have completed about 75 briefings to all levels of the AF, DOD, Industry and the Congress. We have been in the process - about a year now. We think there will be more briefings before this overall process is approved. One of the objections we see in Congress is that they don't want to approve the multi-year program on the basis of budgetary data. They want firm contractual commitments. This overlooks the fact that Congress approves annual programs on the basis of budgetary data. The thrust we see in the Congress and with the GAO is for hard contractual data which means negotiated contracts that have been signed by the companies. Apparently Congress wants to evaluate those contracts. That puts us in a Catch 22 situation that is described on the bottom of this chart. Congressional approval is needed to achieve the savings through the EOQ, since we in defense consider that part of the multi-year process, but you can't get approval without the hard data. You can't contract without their approval and they won't approve until you have the contract. We are really on the horns of dilemma here with the Congress and that is an area that needs to be worked out between the DoD and the Congress.

The Bottom Line is we need to understand and streamline that multi-year approval process. We need to be able to better justify the multi-years savings. Congress wants firm data and since we negotiate on an annual basis, it is virtually impossible to compare an annual contract or a series of annual contracts which you would not have with a multi-year contract that would cover several years. Another thing that we need to do is reestablish the integrity of the confidence in multi-year with both industry and the Congress. We think that industry is particularly confused about this point because there are so many starts and stops. We have to ask them for a whole lot of data to support the various questions that are coming from Congress; then industry starts to question our resolve for multi-year. We think that the way to solve this problem is through a two step process. Step one is to get approval on the basis of budget data for economic order quantity (EOQ) contract awards. Then, with that, achieve timely contracts for a full multi-year award after we negotiate the multi-year contracts with the Congress. We believe if we can start that double process, the bulk of the savings would be achieved since they occur from the economic order contracts. We would then award EOQ contracts to subcontractors we think can save the bulk of the dollars. This would achieve what Congress would like, and that is firm proposals before final approval. We proposed that to GAO and they seemed receptive to this approach. We believe this is going to allow us to save a lot of money and in addition, we believe it is going to incentivize industry by providing long term production rates, to modernize their production base.

Now the last subject is handling concurrency in logistic acquisitions. The problem that we have when you establish a fully concurrent program can be summarized in these three problems: Number one is typical of government - we don't man our logistics organization until well along within the program. I would submit that that is probably true in industry as well. Another problem is providing stable funding and leadtimes for that funding so that we can provide for the logistic support that we need. The final problem lies in providing the phase and support development based on the hardware maturity that you have. It is typical for both Government and industry that we don't recognize early enough the workload that has to occur. In the B-1, we are going to have some 5,000 pieces of support equipment and have some 5400 technical orders. Our work involved in providing the equipment is on an exponential scale. So you need to get the key people, both government and industry, on board early and establish your planning and the priorities that you have for bringing all of that support equipment on line. Then you must structure and organize so that everybody in that organization has visibility in the total task and progress in achieving that total workload. Funding leadtime is another critically important problem for us. We started the B-1 program with adequate but tight funding. The first thing Congress did was to cut some 52 million dollars for spare engines out of our budget because they said you never need spare engines that early. We have been fighting that program ever since. Ever since the program was started we have struggled to achieve the recognition that we must have the funding up front if we are going to provide the support equipment and make this system supportable. Part of our problem is the entire structure of the logistics process. It is structured as a sequential process, but with our concurrency, we need parallel processing. The support equipment requirements documents, the certification process, and the logistic support analysis are based on the sequential process. We have had to put structure in the program so that we can take on those processes in parallel in order to have the support equipment available in time when we field the airplane. We need to be able to fund these equipments with our associate contractor on the basis of parametric estimates and not attempt to get firm proposals from them. In many cases we can start those long leadtime items, and then identify some of those critical items we need to use interim contractor support to assure that the system itself is supportable as we move through the process. The whole logistics process compared to the aircraft development is a natural leader/follower. Normally, the aircraft development precedes the support equipment development so that we design support equipment that addresses the changes that we have made in the basic aircraft systems. In our situation, hardware instability adds to the risk that we have in support. In order to correct that problem we are using a lot of off-the-shelf equipment that is available to the AF. We are making extensive use of a lessons learned data bank that the AFIC - Acquisition Logistics Division has in place so that we can benefit from the experiences of other programs. We have also tried to identify many of these high risk areas and use interim contractor support to allow the hardware to mature before we have to buy that support equipment. This leads, we believe, to supportability and is going to ultimately lead to a far higher quality product.

In summary, we think, that in order to provide that Quality product that is supportable, we need to streamline the decision process particularly as it involves the multi-year and funding for long leadtimes items. We think that industry has to be patient with us while we in government work out these problems and try to understand the starts and stops that are bound to occur in this kind of process. We think the payoff is going to be a quality weapons system that will be affordable and supportable.

Thank you.

PRESENTATION BY
REAR ADMIRAL WAYNE E. MEYER, USN
PROJECT MANAGER, AEGIS SHIPBUILDING

I try to start my talks with the problem -- (shows picture of ADM GORSHKOV). This is the problem we are dealing with in the Navy and I want to say a word about it. ADM Sergei Gorshkov is the Chief of Naval Operations of the Soviet Union. He has been the Chief of Naval Operations for some 26 years, and for a long time, seers have been predicting his demise, but as in the case of a number of others, he is not demised yet. Many of us quote one of his slogans or perceived slogans, .. namely, "Better is the Enemy of Good Enough." Most of us choose a particular interpretation. We choose that slogan to mean the right thing to do is good enough, but did you ever think about it in the other direction... Better really is the enemy of good enough and my view is if his slogan is "good enough" we are going to beat him. The reason we are going to beat him is because we are better.

Why do I say he is the problem? Well, several speakers today have brought up the matter of motivation, and I lecture and travel to officials and workers all over the U. S. associated with the AEGIS Program, to try to get them to have a feeling why they are here.

This is the bottom line (shows picture of AEGIS Cruiser TICONDEROGA). This ship is a mosaic represented by the artifices of hundreds of thousands of people throughout the U. S. This ship was programmed a few million dollars short of one billion dollars in 1978. It takes five years to build a ship like this. It takes thousands of suppliers, it takes determination after determination, if you are going to make it work. The shipbuilder was selected competitively, the designer and manufacturer of the weapons system was selected competitively and they were all given cost contracts. This billion dollars worth of effort has been conducted on a budget for five years and within a few months, all of those contracts will have completed themselves without nary a wrinkle, hiccup or tear, or even any notice in Washington, D. C. They will have converged temporally and fiscally with no fuss - the parts, paper, ammunition, training. 360 men are sailing in this ship today, creating havoc and devastation throughout the Carribean in her exercises. She has sunk or knocked down every target she took after for the past three months of operations, since Valentine's Day this year. She has broken all shipbuilding records; the design team and production team have broken all those records. According to my calculations during that period, the actual returns for inflation compared to what I was allowed to budget equalled a little bit better than 100 million dollars. I was granted relief for some 27 million dollars which means we ate 75 million dollars some place.

Ten of these ships have been appropriated by the Congress to date. RCA, who is the weapons system builder along with a team of subcontractors, has reduced the cost of system number ten from system number one by 2 1/2. General Dynamics, who is the designer and builder of the missiles as ammunition has reduced the cost of the missile round by a factor of three. Ingalls Shipbuilding, who designed and built the ship - and by the way....this ship is 6 1/2 million manhours in construction....has reduced the number of manhours by 1/3: All done on cost contracts, all managed to budget.

I want to make a couple of points here, because Mr. Weisz made a statement today very dear to my heart concerning contracts and specifications. I do not believe, and not everyone certainly agrees with me...not in the Navy...that one can build or pursue such complex undertakings as this with fixed price contracts. We must think of such complex articles as like a cathedral and frankly I don't think the quality is all bad. We should stop flagellating ourselves so much on that.

We have trained the American public well in test and evaluation and we now have that monster hanging around our neck. We have trained it well in reliability and we are being taunted by that. We have trained it well in the virtues of competition, and now that is being tossed back at us. I suggest that we be careful how we train it on the subject of quality, because it (the public) might come to believe that we are all bad.

There are three areas that I would like to spend a minute on related to how Quality is obtained in this program. They are all people oriented. (Of course, this program is a little bitty ol'e program compared to (MG) Bill Thurman's program (B-1 Bomber) and on a proprietary basis, it doesn't bother us in AEGIS that he is number one - we are satisfied in just being AVIS, as long as we can keep the right profile.):

a. My first area is engineering. Dr. Gunneson gave a superb talk this afternoon, and I had tentatively given him an Award Fee of 100% since I am the promoter of award fees for contracts, but I dropped him two points on one statement that he made. While it was correct, I wish he wouldn't have made it. He said you can't build Quality in. I maintain that our fundamental problems start in our engineering departments in the U. S. I don't care how much additional testing one does, it matters not a bit if we can't do a fundamental design correctly. I don't know exactly how to go about providing Quality Assurance in engineering, but I have been trying it with a lot of our contractors and producers and there are some bright spots in what we have done. Mostly, when you send the quality people into engineering, to start doing quality assurance, they start breaking out the drawings and examining the grade of india ink used and whose signature goes in the corner and whether the changes were properly recorded and stuff like that. That is not the quality I am talking about. The Quality needed is that our engineers need shaking down by hard nosed engineers and by their own leaders. Most of our contractors are perfectly capable of doing this when they submit a bid proposal. Contractors who submit proposals do this in the form of audit teams, red teams, different kinds of schemes, to vigorously examine that engineering design, but it does not go on very much, outside that. Once we start a design, it becomes expedient and easy to keep moving on. That is a fertile area throughout the U.S. that could really do much to turn out a hopeful product and that brings me then to my next point.

b. It has to do with proper leadership and the foreman. I call it the "foreman effect." In that process, the only people really ever measured are the foremen of the world: They are measured in terms of time and dollars and they are confronted with decisions, day after day. Trivial ones, complex ones, difficult ones - my experience has been, if you are part of him, and associate with that process, you can also participate and guide the decisions and cause

to be done what ought to be done, including giving him relief, if need be. But if you are not there, he's going to make the decision and the reason he's going to make it, is because he's being measured, in terms of time and dollars. Now that's not the horrible part yet, because once a foreman makes a decision, it's no longer a problem to him. So, it goes in the non-problem basket - and you never hear of it again. About two years later, you walk along the floor and you say to yourself, my gosh what is that, and they will say, "that's our design." "Who approved that?" When you start tracking it back, it comes down, to a decision had to be made and you weren't there. Of course, the foreman always makes it the way he sees the world.

c. The third point is related to dissatisfied worker. That was not exactly said today, but it was implied. I have not found any place in this country where wages matter that much in motivating people. There is a longing, a yearning: That is why I started with ADM Gorshkov. Flags, plaques, dinners, circles - fulfillment is being sought by the worker throughout our plants all over the land. It is true at the shipyard, it is true at RCA, it is true in General Dynamics, it is true in Raytheon and it is true in General Electric. How do you do this? —well, I guess we have to go back and start picking on the General Manager because it starts there. I was particularly pleased when someone said this morning — I think it was P. X. Kelley—that many contractors do not use our military correctly. Because our military can go a long ways towards providing that motivation. I have one particular example with me. I hoped to have a slide, but I just got the picture this morning (hold up photograph of picture with Raytheon workers in AEGIS T-Shirts). You have to resort to all kinds of things up in the big Raytheon plant at Waltham, where there are two products. (MG) Max Bunyard (Patriot Project Manager) has the product called Patriot - in half of the plant, and, of course, Raytheon is his prime contractor, so he gets a lot of attention. Now lowly little AEGIS up there, not having nearly the amount of dollars that Patriot has, and Raytheon being only a subcontractor in this case, has to resort to other tricks. So, we periodically get the Admiral walking through the plant - here he is in the photograph with all the production workers and an "AEGIS" T-Shirt - not made by me - made by the workers. I show it to you as an example of the kind of near spontaneous things that have to be done, in my view, —to satisfy the workers.

In summary, the nature of the AEGIS Program to date has been to operate within the budget, generate the right form of contract, because if the wrong contract is formed, the rest doesn't matter, do eyeball to eyeball interface through our naval officers and petty officers, to "out Japanese" the Japanese in review in the Engineering departments and when things need to be changed, change them.

We believe in trust and attempt to provide trust as a two-way street in this project. I forget what Under Secretary of Defense said it, but his initials were Packard - a long time ago - "give me a trustworthy project manager in Government and give me a trustworthy project manager in industry and stand out of their way and they will take care of the rest." That is still true, but if it is so true, why can't we get it done? Why are we having so much trouble reviewing engineering? I can tell you why in this project: It's because we are spending all our time with inspectors and auditors and we just don't have enough time left to worry about the unimportant things of Engineering and Quality.

Thank you very much.

PANEL 4 DISCUSSION

Question: (Norman Nielson) There has been an adversary relationship and lessening of dialogue, and this must be addressed in the coming year.

Answer: (VADM Grinstead) I am more on industry's side than the Government's. We find people are guilty of incomplete or missing specifications and demanding an oversight over the contractor which we cannot afford. We are trying to sell a system whereby when a contractor hits a certain level of performance that we begin to back off and get out of his way.

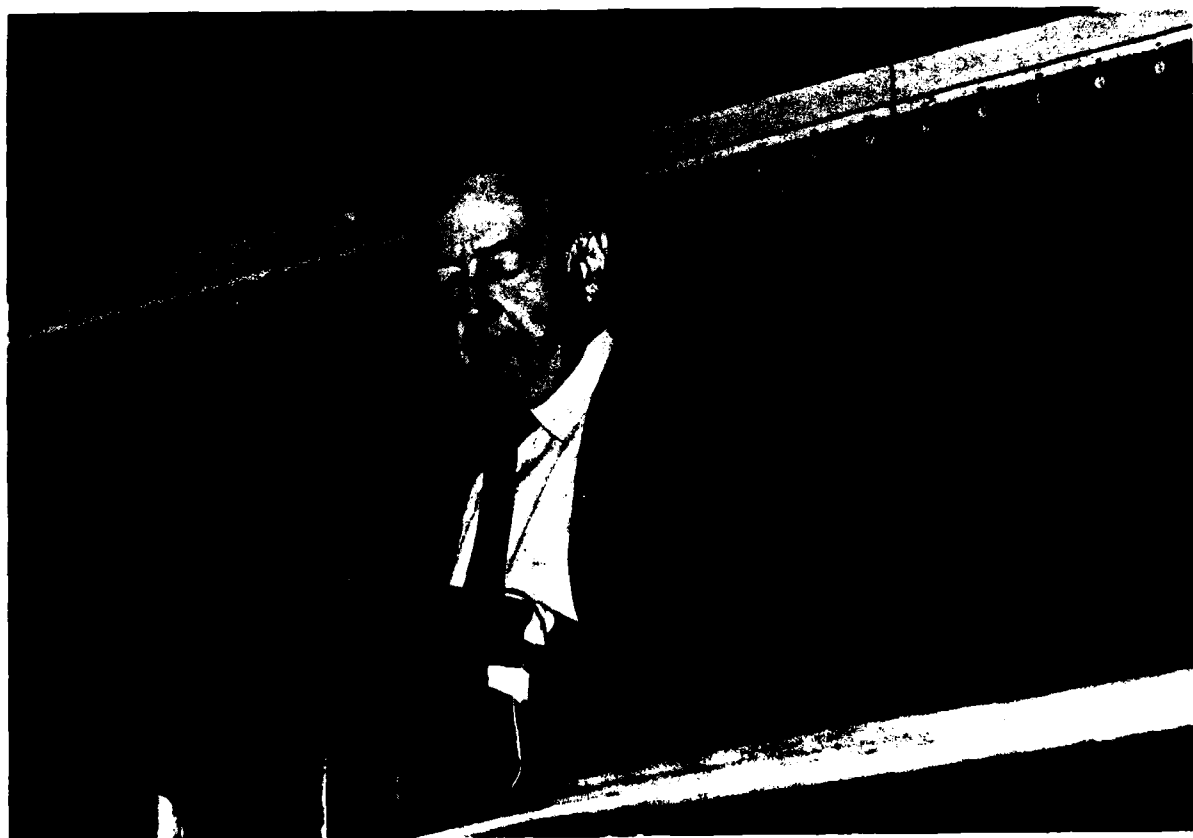
Question: (Mr. Lanier) Is it possible that the consideration of improved quality might be cause to take precedence over the reduction of cost?

Answer: (VADM Grinstead) There is room to create a Qualified Manufacturers List to make a supplier perform to a certain level before we do business with him. There are lots of areas where we ought to shrink the competition and stick to some quality producers. The cost of certain current practices is unreasonable.



BOTTOM LINE II CONFERENCE

1 JUNE 1983



SUMMATION AND CONCLUSIONS
HOWARD K. SMITH, COMMENTATOR

QUALITY - THE VITAL LINK

SUMMATION AND CONCLUSIONS
HOWARD K. SMITH, COMMENTATOR

Admiral Collins, you were talking about computers -- Leo Cherne, the other day, said the computer is accurate, proficient and stupid; man is inaccurate, inefficient and brilliant. God knows what the combination is going to do to the world.

Ladies and Gentlemen:

You have been subjected to a lot of words today. Good words, but still a lot of words. I promise to keep mine down to the minimum required to fulfill the function to which I have been assigned. Among the many things I am not an expert on is the Defense Procurement problem. The last time I addressed an audience on that subject, I was happy to find the Queen of England was part of the audience. Half way through my remarks, I heard her say distinctly - "If that guy knows what he is talking about, I'm the Queen of England."

I don't know where to begin so, I'll begin at the beginning. I thought Admiral Collins' invocation was deeply inspiring. Knowing what he has been through to organize this occasion, I thought he might be tempted to emulate the late William Allen White. William Allen White was a Republican editor of the Emporia, Kansas, Gazette. Once the Democrats of Kansas invited William Allen White to lunch with them and at the luncheon the chairman said, "We're going to ask our friendly enemy William Allen White to deliver the invocation." White stood up and said, "Sir, if it won't be offensive to you, I would like to forego the privilege. The fact is that I don't want God to know I'm here." Admiral Collins doesn't mind if God knows he's here.

It was so gently said by him and Secretary Thayer that you may well have missed it. Some rather sharp charges were made. Admiral Collins prayed that you may so behave that American Industry will once again become a leader among the nations. You cannot once again become a leader unless you have ceased to be the leader. I think that was a very strong and important point.

Secretary Thayer said the cost of correcting defects in our weapons and equipment runs in the range of 10 to 30 percent. He also spoke of very large cost overruns it is hard to justify to the American taxpayer.

After that, Colonel Tash delivered his chilling briefing on the Soviet Threat. It was almost enough to make you want to give up, but I think if you add a comment to that, it will not be. I think we overlook very often what General Vessey, Chairman of the Joint Chiefs of Staff, said recently - "Russia is the only country in the world completely surrounded by hostile Communist nations." Russia has 60% of that superior armed force, those superior numbers, tied down defending her own borders. Forty-nine divisions against China in the East; a great number of divisions in the South against Moslem fundamentalists and the unpredictable Middle East; and more divisions in the West holding down unwilling satellites and facing NATO. Sixty percent of her strength is tied down on her own border and we don't have one GI or one rifle defending ours. So I think we have time not to be panicky and to sit down and work out a strategy. That is what I would like to see more of -- efforts to set down a

strategy and order of priorities on what we need in defense. That I don't think has sufficiently been done. I think Mr. Weinberger's annual reports are the only ones I've seen which contain no indications what the strategy is except to catch up or possibly pass the Russians.

The first panel of Officers from all the Services gave specific examples of failed weapons. General Richardson gave very specific examples of tanks and anti-tank weapons. He and General Kelley emphasized people, which I think should be emphasized: The people who work in your contractor's plants and the people who receive the weapons; the soldier-confidence in the weapons received. I am very sensitive to that because my son was in Viet Nam where he was very badly wounded twice. When the M-16 rifle was given to the troops in Viet Nam, the story got around that there were too many moving parts and the M-16 had jammed quite often. I don't know whether it is true or not, but soldier-confidence immediately collapsed. He used a Russian gun taken while in combat. I think that soldier-confidence is very important. You should never lose sight of it.

General Kelly said he was intimidated by the high level of the audience. Well, if that was intimidation, I do not want to see him uninhibited, spontaneous and enthusiastic except when in combat.

The second panel of industry leaders led by Mr. Murrin suggested what incentives can be given to improve quality on the industry side. I appreciated all their statements, and especially Mr. Haggett's account of specific and stunning successes of the Bath Iron Works. I think it was the most heartening thing I've heard. The most disheartening thing I've heard -- not because he said it, but because it was a fact -- was that Mr. Packard, former Secretary Packard, as a private businessman had his company try out three American-made micro-chips and three Japanese-made micro-chips; and found the Japanese-made micro-chips superior in performance and in cost. That is probably why they have won 70% of the world market in selling those little 64 K chips, even though we invented them in 1958.

The third panel was highly intellectual and entertaining with many pictures. I always like pictures, but frankly I didn't understand many of the pictures they showed except the very first one Mr. Augustine showed. The tank, with its drooping cannon. I understand that one, perfectly. Dr. Hunter displayed a hand calculator, and he held it up and said "this is going to revolutionize the testing of weapons." He didn't tell you that it was made in Japan. Dr. Gunneson was the first one, I think, to say the emperor hasn't got any clothes on. He said the biggest problem -- he didn't say it quite this way -- is not labor; labor is a problem, but not the biggest; it is not Government, Government is a problem, but not the biggest; but management is the main problem. Management is the biggest. We have developed some sloppy management practices in this country. I think our business schools have turned out people disciplined to think in near-term profits; not in the long-term quality of a product being produced. That hurts us very badly. I'm certainly glad he said it.

Now the final panel. We were allowed to listen to Project Managers telling us what their problems are; and especially Admiral Grinstead at the end who knows more about the problems than anyone. I didn't know what a big job he had holding 300,000 contracts with 22,000 contractors. He begged industry for

integrity in order to improve quality. I would like to say that all those men on his staff deserve not only congratulations, but sympathy.

I think I would sum up most of what has been said by a quotation by Dr. Juran - "Exhortation is not going to work -- specific actions by specific people alone will work." I think we want to see how all these fair words we've heard today are going to be put into action and practiced.

Now some comments were made about the media, some criticisms. I think some of them were quite accurate. There is a tendency to be very negative in the media, but you know, people forget that in every 30 minute television broadcast, we are required to have 8 minutes of positive news, good news, people who have met problems and become happy. Those stories are called commercials.

But for the rest, I've said it on television and commentaries, I think we are far too negative, and I wish we could develop a far more positive attitude and look for the positive things. Something must have gone right in the 200 years of American history, because we certainly have succeeded. I think what would help a great deal -- which we have no immediate control over -- is that we need a success very badly. Shedding light on the Defense establishment, you know Viet Nam did not help us; but I don't think it was the fighting man's fault. I think it was a matter of strategy. I don't think we had a strategy in the Viet Nam war, and we eventually lost. Then the episode in the Iranian desert was awfully, awfully bad in contrast to what the Israelis had done rescuing hostages; what the West Germans had done down there in Idi Amin's paradise; and what many others had done. We need a victory really very much. It has been bad luck. I don't think it has been bad military establishments, but bad luck. We need to show the public something good and successful.

Now, I would like to comment on the setting of this conference very briefly: On the past -- why this conference came about.

We are all taking heart now from the signs of a recovery from the worst recession we've had since WWII. Now I hate to be a spoilsport, but I must tell you those signs are still very feeble. The main signs are the 2% increase in the output in this nation the first quarter of this year. That 2% is calculated on a negative output of last year, so it is not very high.

I think the basic cause of our trouble has not yet been touched. Until it is, this recovery is in danger of turning into an interlude between two recessions. I think the trouble is, we've undergone a long-term deterioration of the American economy. In 20 years, nine nations have passed us in output of wealth per capita. Our infrastructure of public facilities is in increasing disrepair without public funds to keep it in repair. Our basic industries are ever less competitive. It is a question as to whether our auto business is going to survive, or our steel industry. The basic cause of our immediate recession is those high, incredibly high deficits -- around \$200 billion. Those deficits are still soaring, there is no sign anybody is going to turn them around. I'm not putting all the blame on Mr. Reagan.

It is both ends of Pennsylvania Avenue that are to blame.

The trouble, I think, is that we emerged from WWII with the only intact, unbombed economy left in the world. A wrecked world came to us to beg, borrow, or buy the means of survival. We gradually, after 35 years of great demand for

American goods, began to assume subconsciously that American economic superiority was a part of a natural order of things. We became a nation of one year thinkers; one-year legislative sessions; one-year budgets; one-year company reports; and as I say our business schools did nothing to alter that.

The Japanese, by contrast, think in terms of 10-20 years. By foregoing present gain in favor of investing in the future, they have damn near run our -- once dominant -- auto industry out of business. They are running us out of many electronic commodity markets: the radio sets we don't produce any more for our customers, and the video tape recorders; and soon the same with them.

This complacency that we suffered after WWII made us a nation of spenders; saving went out of style. Last year, as a typical year, we saved 5% to 6% of our income; the Japanese saved 20%. They have a plenitude of capital with which to modernize their economy; we have a relative paucity.

The Government abetted in this spendthriftiness -- in fact, it led the way. Any company in temporary trouble could get a subsidy and once the subsidy goes on the books, it tends to stay and grow. We created a lot of social programs for the poor. They were good programs at first, but they were open ended -- added to every year -- until they really covered the middle classes and were little help to the poor. The cost, the price, goes up every year. Those are the reasons for the deficits -- and you know what deficits do. They force the Government to cover the deficits by borrowing in capital markets. The Government, in the 1950's - in a typical year - borrowed 5% of our national savings to cover its deficits. Last year the Government borrowed, not 5%, but 75% of our national savings to cover deficits. This crowds out private industry. Even now, in recovery, interest rates are so high farmers cannot reach them. Small farms and businesses are still going bankrupt.

We truly need a strong impetus, and I'm not sure how to go about it, to increase the productivity and in productivity I include quality. Productivity to me means turning out more and better quality goods and services at ever lower costs, and therefore at competitive prices by investing very heavily in innovative new plants, machines, methods and techniques.

We at the National Association of Broadcasters, at Jerry Lee's urging, are undertaking a campaign to spend a half billion dollars of television time advertising productivity. The President says he is aware of the need for it, but I wish he would take more of an active lead and tell the public what it means. Productivity is the only answer to inflation over the long run, and is the only way to create more wealth. It is the only way to become competitive and create that extra national wealth we have to have to carry out his Defense Program. The Defense Program is set at \$1.6 trillion. You know what a trillion dollars is? In one of his graphic television speeches, Mr. Reagan said: "I'll visualize it for you. Think of a \$1,000 bill and then think of a stack of \$1,000 bills; and when you get that stack up 67 miles in the sky, that is a trillion dollars." Well, if we are going to get a trillion dollars for Defense, we are going to have to produce much more and much better than we are producing.

Now the last comment I would like to make is really on the future and the present which make this meeting important. That celebrated worldly philosopher, Al Capone, once said: "You can get more with a kind word and a gun - than you can with a kind word."

Such is the public mood that three years ago there was public enthusiasm for a big Defense Program in this country. People were for it, they felt the need for it. Today, there is a gun pointed at people who are interested in the program, and that gun is public impatience and intolerance. The \$200 billion deficit is getting to the public and the recession has gotten to the public. They are demanding more performance for less cost. I don't know whether it is possible to produce it, but certainly they had better be shown the weapons we are producing are high quality and the price is down where it has to be.

I've said a lot of negative things about America, but I would like to end on a positive note. I agree absolutely with General Vessey, who was asked in a Congressional Hearing "if you were a man from Mars and with no patriotic interest, which problems would you take -- ours or Russia's?" He didn't hesitate -- "Oh, I would rather have our problems any time than those of the Russian soldiers," and I agree with him. We can master ours -- I'm not absolutely sure Russia could master hers.

Well it has been a great pleasure talking to you. Thank you for your attention and your presence. Good-bye.

TAFFRAIL TALK

From my vantage point, Bottom Line II was a tremendous success - made so by the quality of attendees and speakers alike. Bottom Line II represented a dialogue between concerned senior members of industry and defense.

The Quality issue in America is a critical one - an issue which extends not only to defense industries, but to all U.S. industries as evidenced by our decline in market shares once dominated by our nation. It has negatively impacted our economy, our military funding and our combat readiness.

While one or even two or three conferences, such as Defense has sponsored over the past year (Bottom Line I and II and Bottom Line Academia), will not magically remedy the problem, it is a start, and a good one, I believe, in drawing top-level attention to the magnitude of the problem and suggesting means of solving it. Messrs. Packard, Anderson, Murrin, Haggett, Augustine, and Weisz stated the value of Quality from the top industrialists' view, while Admirals Foley, Grinstead, and Meyer, and Generals Gabriel, Richardson, Kelley, Bazley, Thurman, and Bunyard from a military concern and the Honorables Paul Thayer, George Sawyer, and Jim Wade the funding problem from a DoD level.

Drs. Juran, Feigenbaum, Gunneson, and Hunter made valued suggestions on how to approach solution of the Quality problem. Mr. Howard K. Smith's wrap-up was both sobering and optimistic; "the problem is real," he said, "and is costing us jobs, world prestige and a negative economic impact - can we lick it? I am confident we not only can, but we must!"

I sensed a distinct aura of rapport between industry and defense officials on the subject of Quality as I spoke to conferees at the reception which followed adjournment.


I believe we have made a beginning which can prove to be profitable for both industry and defense as we join forces in reinstituting Quality as "the bottom line," for both industry, defense contract negotiators and Program Managers. It can mean increased profitability, productivity, and competitiveness for industry, enhance ROI for stock holders, greater purchasing power for defense and more reliable and capable weapon systems for us military users.

It has the definite potential as a win - win situation if we work as a team; frankly, I see no alternative to such an approach.

My personal thanks to all the professionals on the panels, to the top management attendees, to the Honorable Paul Thayer, and to Mr. Howard K. Smith, for their participation, and to my boss, VADM E. A. Grinstead, USN, for his complete support in these Quality enhancing efforts.

And to the very dedicated and very professional members of my own Quality Assurance Directorate staff whose untiring efforts and attention to detail ensured the success of all the Bottom Line efforts, my heartfelt thanks: a greater bunch of colleagues no Director could wish for in support of our Quality enhancement efforts.

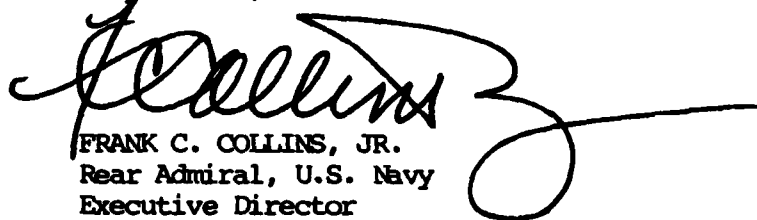
Quality, indeed, is not costly - it is priceless.


FRANK C. COLLINS, JR., Rear
Rear Admiral, U.S. Navy
Executive Director
Quality Assurance

PROPOSED ACTION ITEMS FOR BOTTOM LINE II ATTENDEES

Following is a list of possible action items for your consideration. I'd greatly appreciate if you would review these, comment on the subjects and proposed action agencies and return to me. If you have any recommendations for additional action items, please include them in your response. I've included two copies so you will have no need to even duplicate the proposals but merely fill out the second copy and return. I see this as a positive step in building next year's agenda.

Many thanks,



FRANK C. COLLINS, JR.
Rear Admiral, U.S. Navy
Executive Director
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I CONSIDER THE POTENTIAL OF THIS PROPOSAL TO BE:			SUGGESTIONS FOR POSITIVE IMPACT ON QUALITY	RESPONSIBILITY:		
HI	MOD- EST	LO		PRI- MARY	AS- SIST	
			1. Empanel group from industry, program managers, DLA and OUSD(AM) to evaluate what changes need to be made in contract specifications in order to achieve proper emphasis on Quality; reduce complexity of specifications, and include clarity and flexibility which would allow more effective contract management.	FAR council Ind., Maj P.M.	DLA	
			2. Charter study to investigate effective use of preaward survey recommendations, ensure they are not being overridden due to lack of response to ITB.	OUSD (AM)	DLA	
			3. Organize joint committee to devise standard contract form to achieve greater uniformity of content.	FAR council	DLA	
			4. Authorize study by procurement/contract administration group to determine impact of repetitive waivers and deviations on quality.	OUSD (AM)	Maj. P.M.	

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			5. Explore increased applications of statistics in the design stage of system to determine probability of success in design/production transition.	Ind. & P.M.		
			6. Promote a quality leadership policy within industry oriented toward product reliability vs. warranty.	Ind.		
			7. Produce motivational film or TV tape which highlights total involvement of all personnel within a business or industry.	ASQC Ind.	DLA	
			8. Industry/industry associations endow "Quality Chair" at selected business/engineering institutions.	NSIA AIA EIA ASQC	Ind.	
			9. Congress establish subcommittee which promotes/provides support within the administration for industrial quality emphasis which would include modernization and robotization of industry.	HASC SASC	Ind. DoD	
			10. Establish a task force of industry, PCOs, PMs and DCAS representatives to develop QA techniques for implementation in the development phase.	Ind. Assoc.	Ind. DoD	
			11. Support establishment of a presidential quality award to be presented annually to those industries meeting an established criteria in areas of quality ranging from published policy to product perfection.	Ind., DoD, Ind. Assoc.		
			12. Develop a JUSE-like organization of industry, academe, the scientific, engineering, management community to solve quality problems; publish results and establish training necessary to ensure quality awareness and understanding from top to bottom of industrial hierarchy.	DLA, NAGQ, NSIA APC		
			13. Establish within industry, annual quality goals which could be measured and publicized - but which relate to the product vice marketing plan.	Indiv. Ind.		

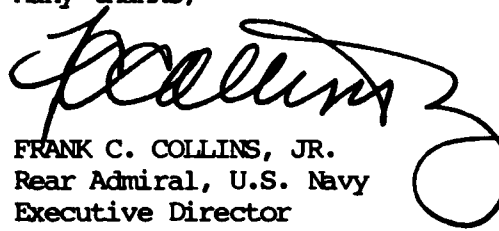
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			14. Establish major contract incentives which focus on contractor's ability to produce products which meet reliability tests vs. schedule.	FAR council		
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			16. Offer to give one or more of your top engineers a sabbatical to teach in a local university and bring his updated understanding of production and quality problems to the attention of future engineers.	Ind.		
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			20. Establish award within DoD for person/organization (two awards) contributing most to enhancement of quality.	OASD (AM)	DIA	

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Rear Admiral, U.S. Navy
Executive Director
Quality Assurance

Defense Logistics Agency
Cameron Station
Alexandria, VA 22314

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BOTTOM LINE II CONFERENCE

1 JUNE 1983



BIOGRAPHIES

QUALITY - THE VITAL LINK



MR. ROY A. ANDERSON

CHAIRMAN OF THE BOARD AND
CHIEF EXECUTIVE OFFICER
LOCKHEED CORPORATION

MR. ROY ANDERSON
CHAIRMAN OF THE BOARD AND CEO
LOCKHEED CORPORATION
P.O. BOX 551
BURBANK, CA 91520

ROY A. ANDERSON

**Chairman of the Board
and Chief Executive Officer
Lockheed Corporation**

Roy A. Anderson was elected chairman and chief executive officer of Lockheed Corporation on September 29, 1977 after having served as vice chairman of the board and chief financial and administrative officer since October 1975.

Joining Lockheed Missiles & Space Company in 1956 as a staff accountant, Anderson advanced to become assistant director of financial operations and director of financial and management controls at LMSC's Space Systems Division. In 1965 he transferred to the Lockheed-Georgia Company as director of finance and was at that facility until his appointment as treasurer of the corporation in August 1968. He became vice president and controller in 1969 and the senior vice president for finance and a member of the board of directors in 1971.

Before joining Lockheed, Anderson served in executive positions with Westinghouse Electric Corporation and Ampex Instrumentation Products Company.

He was born in Ripon, California, December 15, 1920. He was graduated with a bachelor's degree in economics and accounting and a master's degree in business administration from Stanford University. While at the university he was elected to Phi Beta Kappa. He is a certified public accountant. Anderson was a naval officer in both World War II and the Korean conflict.

He is on the board of directors of First Interstate Bank of California; First Interstate Bancorp; Southern California Edison; SRI International, Menlo Park, California; Avantek, Inc. of Santa Clara, California; as well as serving on the board of directors of various Lockheed subsidiaries.

He served as the general campaign chairman of the 1982-83 United Way-AID campaign, Los Angeles area, and was chairman of the board of governors of the Aerospace Industries Association of America, Inc. He was a member of the 1980 U.S. Savings Bond Campaign Committee serving as aerospace industry chairman. He is a member of the Salvation Army Advisory Board. He is a director of the Los Angeles Chamber of Commerce and of the Los Angeles World Affairs Council.



MR. NORMAN R. AUGUSTINE
PRESIDENT
MARTIN-MARIETTA DENVER AEROSPACE

MR. NORMAN AUGUSTINE
PRESIDENT
MARTIN-MARIETTA DENVER
P.O. BOX 179
DENVER, CO 80201

NORMAN R. AUGUSTINE

Norman R. Augustine was born on July 27, 1935 in Denver, Colorado and attended Princeton University where he majored in Aeronautical Engineering and was awarded a BSE, magna cum laude, a MSE, and was elected to membership in Phi Beta Kappa, Tau Beta Pi and Sigma Xi. After graduation he took courses at Columbia University Graduate School of Business Administration, UCLA and USC.

In 1958, he joined what is now the McDonnell Douglas Corporation, holding titles of Research Aerodynamicist, Chief Engineer and Program Manager. Beginning in 1965 he was employed by the Federal Government in the Pentagon in the Office of the Secretary of Defense, occupying positions including that currently designated as an Assistant Under Secretary of Defense for Research and Engineering, and was awarded the Secretary of Defense Meritorious Service Medal. Upon joining the LTV Aerospace Corporation in 1970, he served as Vice President, Advanced Programs and Marketing, for the Vought Missiles and Space Company.

In 1973, Mr. Augustine was appointed by the President and confirmed by the Senate as Assistant Secretary of the Army (Research and Development) and in 1975 became Under Secretary of the Army. He was awarded the Department of the Army Decoration for Distinguished Civilian Service and was twice awarded the Department of Defense Medal for Distinguished Public Service.

In 1977, he joined Martin Marietta Aerospace where he presently serves as a Vice President of the corporation and as President of Denver Aerospace, the latter an entity with sales well in excess of one billion dollars and over 17,000 employees at locations in seven states.

He has served as president of the American Institute of Aeronautics and Astronautics, president of the Association of the United States Army, chairman of the Aeronautics Panel of the Air Force Scientific Advisory Board, and chairman of the Department of Defense's senior advisory group, the Defense Science Board. He has been elected to the National Academy of Engineering and is a Fellow of the American Institute of Aeronautics and Astronautics and of the American Astronautical Society and is a member of the Institute of Electrical and Electronic Engineers. He is a licensed professional engineer in the state of Texas.

Mr. Augustine has served on Boards of Directors of International Laser Systems, Inc., Colorado National Bank, the American Helicopter Society and the Air Force Academy Foundation, and is a Member of the Corporation of the C. S. Draper Laboratory. He has also served as an advisor to the Executive Office of the President, the Departments of the Army, Navy, and Air Force, the Department of Defense, NASA, the General Accounting Office, the National Academy of Science, the Department of Energy, and the North Atlantic Treaty Organization. He is a member of the Board of Regents of the Institute of Cost Analysis and a member of the Board of Advisors of the Society of Logistics Engineers. He has served on advisory boards and boards of visitors to Georgia Tech, the University of Colorado, the Defense Systems Management College, and Florida State University and has chaired advisory councils for Princeton University and The American University. He has been an Associate Editor of the Defense Systems Management Review and on the Editorial Boards of Astronautics and Aeronautics magazine and the Journal of Defense Research.

Mr. Augustine has chaired a national committee of the Boy Scouts of America and held adult leadership positions with the YMCA. He is married to the former Margareta Engman of Stockholm, Sweden and they are the parents of a son, Gregory, a sophomore at Texas A&M University, and a daughter, Rene', who will enter Duke University in the fall of 1983. He is the author of a book entitled "Augustine's Laws", holds a copyright on a slide rule for baseball managers, and is listed in "Who's Who in America".



Biography

United States Air Force

Secretary of the Air Force, Office of Public Affairs, Washington, D.C. 20330

LIEUTENANT GENERAL ROBERT W. BAZLEY

Lieutenant General Robert W. Bazley is vice commander in chief, United States Air Forces in Europe, with headquarters at Ramstein Air Base, Germany.

General Bazley was born Dec. 5, 1925, in Pittsburgh. He graduated from Brentwood (Pa.) High School and received a bachelor of science degree in business administration from the University of Pittsburgh in 1949. He is also a graduate of the Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, D.C.

He entered active duty through the aviation cadet program in January 1944. The general received his navigator wings and was commissioned a second lieutenant in the U.S. Army Air Forces in March 1945.

The end of World War II coincided with his completion of B-29 combat crew training and General Bazley was released from active duty in February 1946. He then entered the University of Pittsburgh.

In November 1951 General Bazley was recalled to active duty and served as an RB-26 navigator with the 12th Tactical Reconnaissance Squadron at Kimpo Air Base, South Korea. During the Korean War he flew 50 combat sorties.

General Bazley entered pilot training in August 1953 and in August 1954 received his wings. Following F-84 fighter weapons training, he transferred to Royal Air Force Station Wethersfield, England, where he served as a pilot, flight commander and assistant operations officer with the 77th Tactical Fighter Squadron, 20th Tactical Fighter Wing.

From May 1958 to June 1960, General Bazley was assigned to the 3502nd U.S. Air Force Recruiting Group with duty in Pittsburgh. He served successively as administrative officer, liaison officer and chief, Recruiting Operations Branch. He then transferred to the U.S. Air Force Academy, Colo., as a staff officer for the commandant of cadets.

Upon his return to England in April 1965, the general served at Royal Air Force Station Lakenheath as operations officer for the 492nd Tactical Fighter Squadron and later as chief, Operations Division, 48th Tactical Fighter Wing. He returned to the United States in 1967 and completed the Industrial College of the Armed Forces.

In August 1968 he went to the Republic of Vietnam and commanded the 531st Tactical Fighter Squadron, 3rd Tactical Fighter Wing, at Bien Hoa Air Base. He flew 257 combat missions in F-100s.



(Current as of December 1981)

O V E R

From September 1969 to June 1970, General Bazley was assigned to Headquarters U.S. Air Force, Washington, D.C., and served in the Directorate of Operations. He then joined the Directorate of Operations in the Organization of the Joint Chiefs of Staff.

General Bazley served as base commander of Randolph Air Force Base, Texas, from June 1972 to November 1972. He then moved to Laredo Air Force Base, Texas, and assumed command of the 38th Flying Training Wing. In October 1973 he took command of the 323rd Flying Training Wing at Mather Air Force Base, Calif.

In August 1975 General Bazley was assigned as inspector general for Headquarters United States Air Forces in Europe at Ramstein Air Base. He became the command's assistant for readiness in June 1976.

He took command of the Air Force Inspection and Safety Center at Norton Air Force Base, Calif., in May 1978. From July 1979 to June 1980, the general commanded Sheppard Technical Training Center, Sheppard Air Force Base, Texas. He then returned to England as commander of 3rd Air Force at Royal Air Force Station Mildenhall. He assumed his present duties in July 1981.

The general is a command pilot and navigator with more than 4,500 hours flying time in a variety of aircraft. His military decorations and awards include the Distinguished Service Medal, Legion of Merit with one oak leaf cluster, Distinguished Flying Cross with one oak leaf cluster, Bronze Star Medal, Meritorious Service Medal, Air Medal with 15 oak leaf clusters, Air Force Commendation Medal with one oak leaf cluster, Presidential Unit Citation emblem, Air Force Outstanding Unit Award ribbon with "V" device and four oak leaf clusters, Air Force Organizational Excellence Award ribbon, Republic of Korea Presidential Unit Citation and Republic of Vietnam Gallantry Cross with palm.

He was promoted to lieutenant general Aug. 1, 1981, with date of rank July 31, 1981.

General Bazley is married to the former Dolores B. Belin. They have four children: Sherry, Barbara, William and Thomas.



MAJOR GENERAL JERRY MAX BUNYARD, USA

**PROJECT MANAGER
PATRIOT AIR DEFENSE MISSILE SYSTEM**

RESUME OF SERVICE CAREER

of

JERRY MAX BUNYARD, Major General

DATE AND PLACE OF BIRTH 3 April 1931, Altus, OklahomaYEARS OF ACTIVE COMMISSIONED SERVICE Over 28PRESENT ASSIGNMENT Project Manager, PATRIOT Air Defense Missile System, Redstone Arsenal, Alabama 35809, since November 1980MILITARY SCHOOLS ATTENDED

The Infantry School, Basic Course

The Field Artillery School, Advanced Course

United States Army Command and General Staff College

The National War College

EDUCATIONAL DEGREES

Oklahoma State University - BS Degree - Animal Husbandry

George Washington University - MS Degree - International Relations

RECENT MAJOR DUTY ASSIGNMENTS

<u>FROM</u>	<u>TO</u>	<u>ASSIGNMENT</u>
Jul 69	Jan 70	Commander, 2d Battalion, 20th Artillery, 1st Cavalry Division (Airmobile), Vietnam
Jan 70	Jul 70	Assistant Chief of Staff, G1, later Chief of Staff, and later Deputy Brigade Commander for Administration, 1st Aviation Brigade, Vietnam
Aug 70	Jul 71	Army Member, Department of Defense Air Munitions Requirements and Developments Committee, United States Army Research and Development and Operations Research Advisory Group, Washington, DC
Aug 71	Jul 72	Student, The National War College, Fort Lesley J. McNair, Washington, DC
Aug 72	May 74	Operations Research Analyst, later Coordinator of Army Programs Presentations, Materiel Programs Directorate, Office, Assistant Vice Chief of Staff, United States Army, Washington, DC
May 74	May 75	Assistant to the Scientific Advisor, and later, Chief, Technical Support Division, United States Army Operational Test and Evaluation Agency, Fort Belvoir, Virginia
Jun 75	Jun 77	Commander, Yuma Proving Ground, Arizona
Jul 77	Jul 79	Project Manager, Tactical Fire Direction System/Field Artillery Tactical Data Systems, United States Army Communications Research and Development Command, Fort Monmouth, New Jersey
Jul 79	Nov 80	Deputy Director, Defense Test and Evaluation, Office of the Deputy Under Secretary of Defense for Research and Engineering, Washington, DC

JERRY MAX BUNYARD, Major General

PROMOTIONS

DATES OF APPOINTMENT

	<u>Temporary</u>	<u>Permanent</u>
2LT	14 Sep 54	24 Sep 57
1LT	16 Mar 56	10 Mar 58
CPT	24 Oct 60	10 Sep 61
MAJ	13 Jul 65	7 Nov 68
LTC	26 Jul 68	10 Sep 75
COL	1 Feb 74	10 Sep 78
BG	1 Jun 79	22 Jan 82
MG		1 Oct 82

US DECORATIONS AND BADGES

Defense Superior Service Medal

Legion of Merit

Distinguished Flying Cross (with Oak Leaf Cluster)

Bronze Star Medal (with 2 Oak Leaf Clusters)

Meritorious Service Medal (with 2 Oak Leaf Clusters)

Air Medals with V Device

Joint Service Commendation Medal

Army Commendation Medal

Master Army Aviator Badge

SOURCE OF COMMISSION ROTC

As of 1 March 1983



REAR ADMIRAL FRANK C. COLLINS, JR., USN

EXECUTIVE DIRECTOR
QUALITY ASSURANCE
DEFENSE LOGISTICS AGENCY

BIOGRAPHY OF REAR ADMIRAL FRANK C. COLLINS, JR., USN, 438-32-0914/1110

Rear Admiral Collins was born in El Paso, Texas. He enlisted in the Navy in 1945; and, upon release from active duty in 1946, he attended Louisiana State University, graduating with a B. A. Degree in 1949. In 1951, he was recalled to active duty and entered the United States Naval Officers Candidate School in Newport, Rhode Island, where, as a member of Class IV, he was commissioned on Ensign in November 1951. Initially assigned to the USS TACONIC (AGC-17), he served as Second Division Officer and later as Gunnery Officer. In September 1953, LTJG COLLINS assumed his first Command, the USS LSS(L) 65. Detached in April 1954 when the LSS(L) was turned over to the French for service in Indochina, he reported to the Commander, MSTC Carrib Sub Area in Balboa, C.Z., as Passenger Operations Officer. His next assignment, the Long Beach-based Destroyer USS H.W. TUCKER (DDR-875), was in June 1956 as Operations Officer and Navigator.

In September 1957, LT COLLINS assumed Command of the USS SALINE COUNTY (LST-1101). In January 1960, he went to the Fleet Anti-Submarine Warfare School in San Diego as Tactics Instructor. He returned to Destroyers in September 1961 as Executive Officer and Navigator of the San Diego-based USS SHIELDS (DD-596). Following a tour as Flag Secretary and Aide to the Commander Cruiser-Destroyer Force, US Pacific Fleet from April 1963 to May 1965, LCDR COLLINS attended the Naval War College in Newport, Rhode Island. He was a distinguished graduate of the War College for the 1965-1966 academic year. Following War College, in August 1966, CDR COLLINS was assigned to the US Naval Support Activity, DaNang, Republic of Vietnam, as Operations Officer. While attached, he made several valuable recommendations which resulted in expediting logistical support for III MAF operating in I Corps. This included dredging the mouth of Cua Viet river near the DMZ in order to accommodate an LST offload port at this strategic logistic location. For this service, he was awarded the Bronze Star with Combat "V," the Combat Action Ribbon, Vietnam Meritorious Unit Citation, Cross of Gallantry with Palm, and Navy Unit Commendation.

In October 1967, CDR COLLINS assumed his first Destroyer Command, the USS JOHN A. BOLE (DDO-755), during which he made two deployments. He was awarded, the Navy Commendation Medal with Combat "V." He was next assigned to Director, ASW Programs in the Office of the Chief of Naval Operations, OP-95. One significant contribution during this three-year tour was the development and Fleet evaluation of Acoustic Deception Devices (ADD). In August 1972, he assumed duties as Chief of Staff to the Commander, Cruiser-Destroyer Flotilla ELEVEN, later redesignated Cruiser-Destroyer Group THREE. He was instrumental in planning and participating in the cruiser raids against Haiphong, Than Hoa and Vinh North Vietnam, in August and September 1972. Upon completion of this tour, he was awarded the Legion of Merit with Combat "V" and a Bronze Star in lieu of a second Navy Unit Commendation. On 5 September 1974, CAPT COLLINS assumed Command of Destroyer Squadron NINE, homeported in San Diego California. During his tour as Commander, Destroyer Squadron NINE,

he prepared the Squadron to shift homeports to Guam M. I. CNO subsequently reversed this decision prior to actual shift, and DESRON NINE was given the special mission of testing and evaluating Special Weapons Systems. This included Harpoon and Tactical Assignment System (TAS) in DOWNES (FF-1070) Aegis, Advanced AAW System in NORTON SOUND (AVM-1) and 8"/55 MCLWG in USS HULL (DD-945). In addition, CAPT COLLINS introduced the 963 Spruance Class DD into the Pacific Ocean.

On 30 June 1976, CAPT COLLINS relieved as Commanding Officer DATC FMAGPAC. This Command, in addition to the 1700 plus men in San Diego, included the 360-man FMAG Detachment in Alameda, California, and the 315-man FMAG Detachment in Pearl Harbor. During CAPT COLLINS' tour at DATC FMAGPAC, the transition from the 3006 Shore Accounting System to the 207/3013 Afloat IMA Accounting and Material Control System was made and an IMA Maintenance Plan for the DD-963/LHA-1/FFG-7/AOR developed. He received a Gold Star in lieu of second Legion of Merit for enhancement of intermediate maintenance procedures and improvement of management techniques.

Selected for flag rank in February 1978, his first flag assignment was as Chief Navy Section, ARMISH-MAAG, Iran in Tehran. There he served as the Chief Advisor to the Commander in Chief, Imperial Iranian Navy (IIN), Admiral Kamal Habibollahi. He introduced a new "management by objectives and results" system for FMS/Special Projects Management. In addition, he began structure of an Integrated Logistics Support System for the 993 KUROUSH Class Cruisers and the TANG Class Submarines which were being purchased from the U. S. Regrettably, before the fruits of either of the projects were enjoyed, a pseudo people's revolution led by Ayatollah Ruhollah Khomeini brought down the Shah's government and caused dissolution of the military. This event essentially terminated the U.S. Advisory effort in Iran and occasioned the evacuation of some 40,000 Americans plus other foreigners from the country. For his innovative and U.S. tie-strengthening leadership, COLLINS was awarded the Defense Meritorious Service Medal, Defense Superior Service Medal, Humanitarian Service Medal and Navy Expeditionary Service Medal.

In May 1979, RADM COLLINS received orders to relieve as Director, Logistics Plans Division (OP-40) under the Deputy Chief of Naval Operations (Logistics) in Washington, D. C. As OP 40, he structured a \$5 billion sea lift program to be executed over the FYDP to ensure adequate sea lift to provide needed strategic mobility for the Deployment Joint Task Force (RDJTF)

In June 1981, COLLINS was assigned as Executive Director, Quality Assurance on the staff of the Director, Defense Logistics Agency. There he began a concerted effort to educate government and industry on the value of "building" vice "inspecting" quality into manufactured goods. He was the proponent of using a "Systems Approach" to Quality Assurance - this concept centered around process control versus inspection.

A frequent lecturer on the cause and effect of the revolution in Iran, and Quality Assurance, RADM COLLINS is also a prolific writer, frequently contributing to the U. S. Naval Institute Proceedings and Guideposts; in addition, he is a four-time recipient of the Freedoms Foundation George Washington Honor Medal Award. An ardent supporter of physical fitness, RADM COLLINS has been awarded five memberships in the Super FIVE Aerobics Club. A dedicated member of the Christian Reformed Church, he was a three-term elder on the council of the Chula Vista Christian Reformed Church and a lay preacher.

RADM COLLINS is married to the former Esther Frances Shiell of New Orleans, Louisiana. They have seven children; five married daughters, Lucille, Sue, Francene, Virginia and Melissa, plus an unmarried daughter, Laura and son, Frank III, and ten grandchildren. The Collins family currently resides in Alexandria, Virginia.

REAR ADMIRAL FRANK C. COLLINS, JR., USN
EXECUTIVE DIRECTOR
QUALITY ASSURANCE
DEFENSE LOGISTICS AGENCY
ALEXANDRIA, VA 22314



DR. ARMAND V. FEIGENBAUM

PRESIDENT AND CHIEF EXECUTIVE OFFICER
GENERAL SYSTEMS COMPANY, INC.

DR. ARMAND V. FEIGENBAUM

Dr. Armand V. Feigenbaum has for sixteen years been president and chief executive officer of the General Systems Company, Inc., of Pittsfield, Massachusetts, an international engineering firm that designs and installs integrated total quality systems for major corporations throughout the world. Before that he was for ten years manager of worldwide manufacturing operations and quality control for the General Electric Company.

In May 1982 he became the first recipient of the Lancaster Award of the American Society for Quality Control for contributions to international cooperation on quality control. He also has received the A.S.Q.C.'s Edwards Medal for contributions to quality management and technology.

He is a fellow of the American Association for the Advancement of Science, the founding chairman of the International Academy for Quality, a past chairman of the Council for International Progress in Management, and a past president and chairman of the American Society for Quality Control.

Dr. Feigenbaum earned his doctorate at the Massachusetts Institute of Technology. He is the author of Total Quality Control, a book that has been published in many languages and has had a profound influence on management and industrial concepts in the United States, Japan, Europe and Latin America. An all-new edition of the book was brought out by McGraw-Hill in March 1983.

General Systems Company, Inc.
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U.S.A.

**ADMIRAL SYLVESTER R. FOLEY, JR.
COMMANDER IN CHIEF U.S. PACIFIC FLEET**



Sylvester R. Foley, Jr., was born in Manchester, New Hampshire, on September 19, 1928. A 1950 graduate of the U. S. Naval Academy, he was designated a naval aviator in 1952. In 1968 he received a Masters Degree in International Affairs from George Washington University after graduating with distinction from the Air War College in Montgomery, Alabama. His first assignment was with Composite Squadron FOUR, which included deployments to the Western Pacific and Mediterranean as a night fighter and special weapons pilot. In 1956 he returned to the Naval Academy as an instructor in seamanship and navigation, before returning to the fleet

with Attack Squadron THIRTY-SIX aboard USS SARATOGA (CV 60). After attending the Naval War College, he reported to the Staff Commander in Chief, U. S. Naval Forces Europe as the Aviation Readiness and Training Officer. During this tour, he completed basic airborne training with the U. S. Army Special Forces. His first command came in 1966 when he assumed command of Attack Squadron ONE HUNDRED SIX after serving a year as executive officer of the squadron. He assumed command of Attack Carrier Wing ELEVEN on USS KITTY HAWK (CV 63) in 1968. In October 1969, he reported to the Office of the Chief of Naval Operations to serve on the Weapons System Analysis Staff and later in Tactical Aviation Plans. In August 1971, he assumed command of USS CORONADO (LPD-11), which was deployed to the Mediterranean as SIXTH Fleet Amphibious Force Flagship. In July 1972, he assumed command of USS MIDWAY (CV 41). Fourteen months later he was assigned as Chief of Staff to the Commander SEVENTH Fleet. His selection to Rear Admiral led to his assignment as Deputy Director, Strategic Plans and Policy Division in OPNAV, Washington D.C. From September 1976 until February 1978, he was Commander Carrier Group SEVEN. He assumed the rank of Vice Admiral on May 31, 1978 and became Commander SEVENTH Fleet before his assignment as Deputy Chief of Naval Operations (Plans, Policy and Operations). Admiral Foley assumed command of the U. S. Pacific Fleet in May 1982.

Admiral Foley is married to the former Kathleen MacDonald of Forest Hills, New York. They have four children: Captain Robert Foley, USMC; Lieutenant Junior Grade Maureen Foley, USN; Brenda and Christopher.

ADMIRAL SYLVESTER FOLEY, JR., USN
COMMANDER-IN-CHIEF
U.S. PACIFIC FLEET
(CINCPACFLT)
PEARL HARBOR, HI 96860



Biography

United States Air Force

Secretary of the Air Force, Office of Public Affairs, Washington, D.C. 20330

GENERAL CHARLES A. GABRIEL

General Charles A. Gabriel is chief of staff of the U.S. Air Force, Washington, D.C. As chief, he serves as the senior uniformed Air Force Officer responsible for the organization, training and equipping of a combined active duty, Guard, Reserve and civilian force of nearly one million people serving at approximately 3,000 locations in the United States and overseas. As a member of the Joint Chiefs of Staff, he and the other service chiefs function as the principal military advisers to the secretary of Defense, National Security Council and the president.



General Gabriel was born Jan. 21, 1928, in Lincolnton, N.C. Following graduation from high school, he attended Catawba College, Salisbury, N.C., for two years before entering the U.S. Military Academy, West Point, N.Y. He graduated from the academy in 1950 with a bachelor of science degree and a commission in the U.S. Air Force. The general earned a master of science degree in engineering management from The George Washington University, Washington, D.C., in 1963. He graduated from the Command and Staff Course at the Naval War College, Newport, R.I., in 1962; and the Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, D.C., in 1967.

After graduation from West Point, General Gabriel entered pilot training at Goodfellow Air Force Base, Texas, and completed advanced training at Craig Air Force Base, Ala., in December 1951. His first assignment was to South Korea, where he flew 100 combat missions in F-51s and F-86s and was credited with shooting down two MiG-15s.

From December 1952 to November 1955, the general was assigned to the 86th Fighter-Interceptor Wing, Landstuhl Air Base, Germany, as a pilot and later a squadron air operations officer. He then spent three years as an air officer commanding at the U.S. Air Force Academy, Colo.

In July 1959 General Gabriel transferred to Moody Air Force Base, Ga., where he served as adjutant for the 3550th Pilot Training Group and commander of the Headquarters Squadron Section. Following graduation from the Naval War College in August 1962 and completion of his master's degree at The George Washington University in August 1963, he was assigned as a staff officer in the Directorate of Plans, Headquarters U.S. Air Force, Washington, D.C., until August 1966 when he entered the Industrial College of the Armed Forces.

Returning to Europe in August 1967, the general served as executive officer to the chief of staff, Supreme Headquarters Allied Powers Europe, Mons, Belgium. He returned to the United States for combat crew training in July 1970 and was subsequently assigned as commander of the

432nd Tactical Reconnaissance Wing at Udorn Royal Thai Air Force Base, Thailand, flying 152 combat missions in F-4s. He returned to the Air Staff in July 1972, as deputy for operational forces and deputy director of operations.

General Gabriel served as deputy chief of staff for operations at Headquarters Tactical Air Command, Langley Air Force Base, Va., from February 1975 to August 1977. He then became deputy commander in chief, U.S. Forces Korea and deputy commander in chief, United Nations Command, Seoul, South Korea.

In April 1979 he returned to Air Force headquarters as deputy chief of staff for operations, plans and readiness. The general served as commander in chief, United States Air Forces in Europe and commander of Allied Air Forces Central Europe at Ramstein Air Base, Germany, from August 1980 to June 1982. He assumed his present duties in July 1982.

General Gabriel is a command pilot with more than 3,800 flying hours. His military decorations and awards include the Defense Distinguished Service Medal, Air Force Distinguished Service Medal, Legion of Merit with one oak leaf cluster, Distinguished Flying Cross with four oak leaf clusters, Air Medal with 14 oak leaf clusters, Air Force Commendation Medal with one oak leaf cluster, Presidential Unit Citation emblem, Air Force Outstanding Unit Award ribbon, Republic of Korea Order of National Security Merit (Gugseon Medal) and Republic of Korea Presidential Unit Citation.

He was promoted to general Aug. 1, 1980.

General Gabriel is married to the former Dorothy Cutts of Oxford, N.C. They have two children: Jane and Charles.



DEFENSE LOGISTICS AGENCY

HEADQUARTERS
CAMERON STATION
ALEXANDRIA, VIRGINIA 22314

Vice Admiral Eugene A. Grinstead

SUPPLY CORPS, UNITED STATES NAVY

DIRECTOR, DEFENSE LOGISTICS AGENCY

Eugene Andrews Grinstead was born in Durham, North Carolina, in September 1923, son of Eugene A. and Ann B. (Childress) Grinstead. In December 1942, he enlisted as an Apprentice Seaman in the U.S. Naval Reserve at Raleigh, North Carolina, and in July 1943, reported for active duty as a student at the University of North Carolina at Chapel Hill. He had instruction at the Naval Reserve Pre-Midshipmen's School, Asbury Park, New Jersey, during February and March 1944, then had further training at the Naval Reserve Midshipmen's School, New York, New York. While there, he was appointed Midshipman in the U.S. Naval Reserve and in August 1944, was commissioned Ensign. He was appointed Lieutenant (Junior Grade) in the Supply Corps of the U.S. Naval Reserve in April 1946, and subsequently advanced in rank to that of Vice Admiral in June of 1981 having transferred from the Naval Reserve to the U.S. Navy in August 1946.



After receiving his commission in 1944, he had instruction at the Naval Officer Training School, Camp Shelton, Norfolk, Virginia, until September of that year, then had training in mine disposal and recognition at the Navy Yard, Washington, D.C. He was an officer trainee at the Naval Combat Demolition Training and Experimental Base, Kamaoale Maui, Territory of Hawaii, from April to July 1945, then joined Underwater Demolition Team TWELVE. In January 1946, he was assigned to Underwater Demolition Team TWO to serve as Executive Officer and Communications Officer and while in that assignment, had temporary duty, between May and August 1946, with Underwater Demolition Team "EASY."

During the period October 1946 to March 1947, he was a student at the Navy Supply Corps School, Bayonne, New Jersey, then had duty as Supply and Disbursing Officer on board USS GREENWICH BAY (AVP-41), which operated as escort ship to the Presidential Yacht WILLIAMSBURG. In September 1948, he joined Fleet Aircraft Service Squadron ONE HUNDRED EIGHT and in March 1950, reported as Control Branch Officer at the Naval Air Development Center, Johnsville, Pennsylvania. He remained there until August 1952, then served as Assistant Supply Officer on the Staff of Commander Fleet Air, Eastern Atlantic and

Mediterranean. He headed the Power Plant Branch at the Aviation Supply Office, Philadelphia, Pennsylvania, from October 1954 to January 1958, then attended the Armed Forces Staff College, Norfolk, Virginia.

In July 1958, he joined USS FRANKLIN D ROOSEVELT (CVA-42) and in May 1960, was detached for duty as Assistant Head of the Supply Demand Control Point Operations Branch and Head of the Weapons System Section, Bureau of Supplies and Accounts, Navy Department, Washington, D.C. In July 1963, he reported as Supply Officer at the Naval Air Station, Oceana, Virginia Beach, Virginia. He was awarded the Navy Commendation Medal for "...his guidance and sound management practices (which) contributed most significantly to the ultimate adoption of the SNMMS (Standard Navy Maintenance and Material Management System) for Navy-wide use. . ."

Returning to the Aviation Supply Office in November 1965, he served as Planning and Operations Officer and "for exceptionally meritorious service. . ." in that assignment was awarded the Legion of Merit. The citation further states in part: "...Captain Grinstead was responsible for and directly supervised the design, establishment and operation of many policies, programs and procedures which significantly improved the effectiveness of the Aviation Supply Office in support of naval aviation. . ." While at the Aviation Supply Office, he attended the Harvard Advanced Management Program (AMP-52). In July 1969, he reported as Supply Officer at the Naval Air Station, Jacksonville, Florida, with additional duty as Staff Supply Officer on the Staff of the Commander Fleet Air, Jacksonville. He was awarded the Meritorious Service Medal and cited in part as follows: "... Through his exceptional direction and supervision, (he) achieved a completely responsive supply support organization which enabled other commands to meet operational commitments. . ."

He reported in June 1970 as Assistant Chief of Staff for Supply to the Commander Naval Air Force, U.S. Atlantic Fleet. For his outstanding service in this assignment he was awarded a Gold Star in lieu of a second Legion of Merit. In July 1972, he became Director of the Material Division, Office of Chief of Naval Operations, Washington, D.C., and on 27 August 1975, became Vice Commander, Naval Supply Systems Command. On 1 March 1977, he became Commander, Naval Supply Systems Command and 33rd Chief of Supply Corps.

For his service there, he was awarded the Distinguished Service Medal. The accompanying citation read, in part, "...his enlightened leadership, his unequalled knowledge of logistics and his outstanding managerial abilities have modernized and transformed the U.S. Navy supply system." He was also cited for his orchestration of the "planning, budgeting, contract negotiations and award for the \$81 million Navy Integrated Storage, Tracking and Retrieval System, which is the largest, most comprehensive material handling modernization program ever undertaken by any of the Armed Services."

Vice Admiral Grinstead became the seventh Director of the Defense Logistics Agency on 30 June 1981, after being appointed by President Reagan and being confirmed by the Senate.

The Defense Logistics Agency with headquarters in Alexandria, Virginia, was established in 1961 and employs 48,000 military and civilians. DLA provides worldwide supply and logistics support to the Military Services, administers Defense contracts, disposes of surplus Defense property and provides other Defense-related technical logistics services.

In addition to the Legions of Merit, the Meritorious Service Medal and the Navy Commendation Medal, Vice Admiral Grinstead has the China Service Medal; American Campaign Medal; Asiatic-Pacific Campaign Medal; World War II Victory Medal and the National Defense Service Medal with bronze star.

Vice Admiral Grinstead is married to the former Gayle Marie Kane of Raleigh, North Carolina. They have nine children, Eugene A. III, Mary K., Kurt M., Mark, Karen A., Matthew, Robert, Michele and John.



DR. ALVIN O. GUNNISON
CHIEF EXECUTIVE OFFICER
GUNNISON GROUP INTERNATIONAL

BIOGRAPHY

Dr. Alvin O. Gunneson

Dr. Gunneson is Chief Executive of the Gunneson Group International, a consulting company specializing in assisting U.S. multinational corporations implement formal quality and productivity improvement programs in their operations worldwide.

He is also the Chairman of the National Advisory Council for Quality.

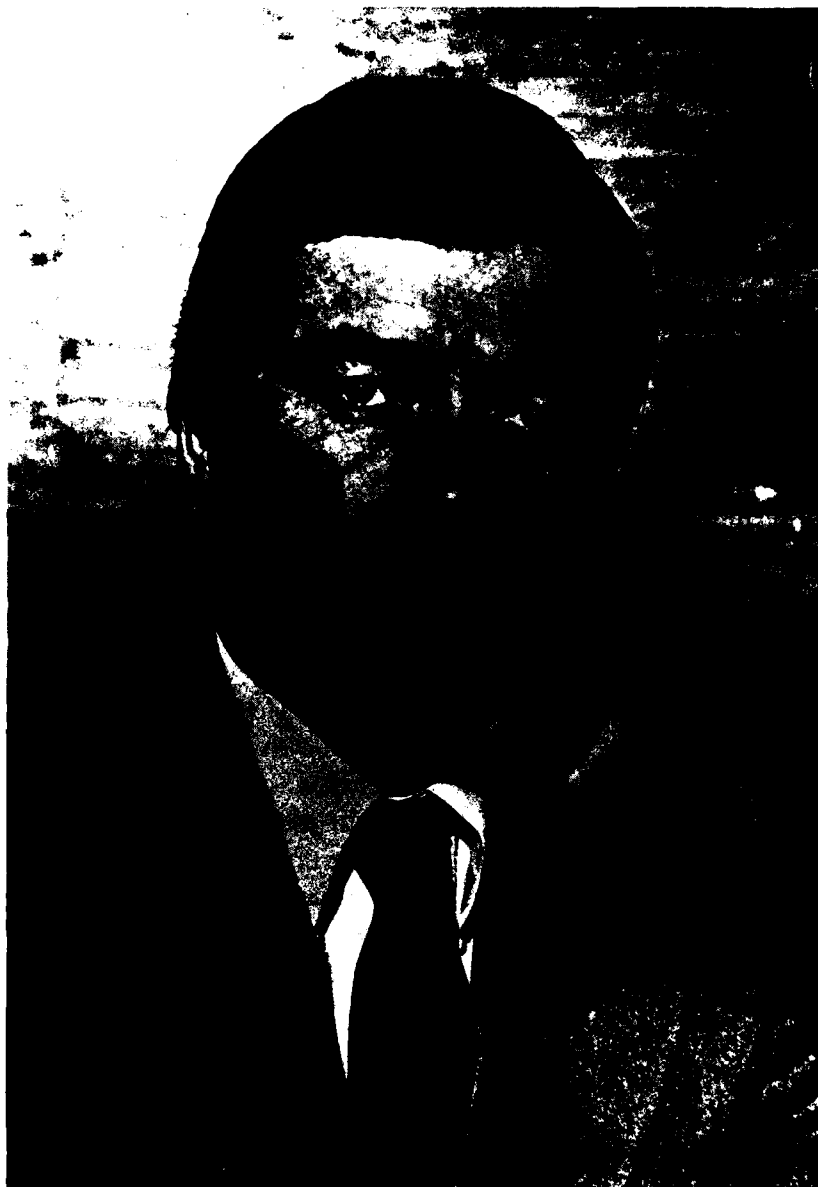
Before forming his own company, he was with the Revlon Corporation for four years as the Vice President for Quality worldwide, where he provided leadership for quality improvement activities and managed worldwide quality operations.

Prior to that, he spent three years with the General Instrument Corporation as the Director for Quality, worldwide; and twelve years with ITT in various engineering, production and quality functions culminating with a Director of Quality position at ITT World Headquarters. Earlier, he was with the Bendix Corporation in their missile guidance engineering and test operations.

Dr. Gunneson has been an elected government official for ten years where he had administrative responsibility for various institutions, agencies and utilities.

He has earned undergraduate degrees in electrical engineering and industrial psychology, a masters in management and a doctorate in international business and finance from Pace University in New York.

**DR. ALVIN GUNNESON
CHIEF EXECUTIVE OFFICER
THE GUNNESON GROUP
40 CONKLIN ROAD
FLANDERS, NJ 07836**



MR. WILLIAM E. HAGGETT

**PRESIDENT AND CHIEF OPERATING OFFICER
BATH IRON WORKS CORPORATION**

WILLIAM E. HAGGETT

BIOGRAPHICAL SKETCH

BATH IRON WORKS CORPORATION

- January 1981
to present - President and Chief Operating Officer, responsible for Engineering, Planning, Operations, Materials, Program Management, Manufacturing Engineering and Marketing.
- 1975/1980 - Executive Vice President and Chief Operating Officer, responsible for Operations, Engineering, Planning, Manufacturing Engineering and Program Management.
- 1970/1975 - Vice President - Marketing
- 1968/1970 - Assistant to the President, with general staff responsibilities, including Industrial Relations and Corporate Affairs.
- 1963/1968 - Progressed from Buyer to Assistant Purchasing Agent, to Assistant Contracts Manager, to Director of Public Relations.

BROWN WALES COMPANY

- 1960/1963 - Manager of Sales in Maine

UNITED STATES AIR FORCE

- 1957/1960 - Lieutenant

Born in Bath, Maine, in 1934.

EDUCATION

- 1952 - Morse High School, Bath, Maine
- 1956 - Colby College, Waterville, Maine -- B.A.
- 1967 - Harvard Graduate School of Business Administration, Middle Management Program

OUTSIDE ACTIVITIES

- 1964, 1966 - Bath City Council
- 1964/1965 - Chairman, Bath City Council
- 1966/1974 - Trustee, Hyde School
- 1973
to present - Director, Casco Bank
- 1982
to present - Trustee, Colby College
- 1978/1980 - President, Associated Industries of Maine
- 1972/1973 - Maine Management Cost Survey - Executive
Committee
- - Lectured at Naval War College and throughout
United States as an advocate for stronger
United States Navy and Merchant Marine

MR. WILLIAM E. HAGGETT
PRESIDENT AND COO
BATH IRON WORKS, INC
BATH, ME 04530

February 16, 1983



DR. JOHN STUART HUNTER

CONSULTANT AND PROFESSOR EMERITUS
PRINCETON UNIVERSITY

DR. STUART HUNTER
PROFESSOR EMERITUS
PRINCETON UNIVERSITY
100 BAYNARD LANE
PRINCETON, NJ 08540

RESUME FOR J. STUART HUNTER

J. Stuart Hunter is Professor Emeritus, School of Engineering, Princeton University. He received his B.S. degree in electrical engineering and his M.S. degree in engineering mathematics from North Carolina State University. His PhD degree in experimental statistics is from the Institute of Statistics of the Universities of North Carolina and N.C. State. He has published extensively, his main areas of concentration being the fractional factorial and response surface experimental designs. He is a leader in the exposition of statistical methods, most particularly in the applications of modern statistics for enhancing product quality and production efficiency. He is the instructor in two educational television series on the statistical design of experiments and on problem solving and decision making. He is the founding editor of Technometrics, a technical journal co-sponsored by the American Statistical Association (ASA) and the American Society for Quality Control (ASQC). He has received the Shewhart Medal, and the Ellis Ott and Brumbaugh Awards of the ASQC. He has been a staff member of the National Academy of Sciences: Committee on National Statistics, and the Chairman of the Advisory Board, Applied Mathematics, National Bureau of Standards. He is a fellow of the ASA, ASQC, the Royal Statistical Society and the American Association for the Advancement of Science. He has served as Chairman of the Committee of Presidents of Statistical Societies and the Section of Physical and Engineering Sciences of the ASA. He is the co-author with I. Guttman and S.S. Wilks of the text Introductory Engineering Statistics, and with G.E.P. Box and W.G. Hunter of the book Statistics for Experimenters. He is an editor of the John Wiley Series on Probability and Statistics. He is currently a consultant to industry and government agencies.



DR. JOSEPH M. JURAN

CHAIRMAN
JURAN INSTITUTE, INC.

J. M. JURAN
866 UNITED NATIONS PLAZA
NEW YORK, N. Y. 10017

J. M. Juran has since 1924 pursued a varied career in management as engineer, industrial executive, government administrator, university professor, impartial labor arbitrator, corporate director, and management consultant. This career has been marked by a search for the underlying principles which are common to all managerial activity. Applied to the specialty of management of quality control, this search has produced the leading international reference literature and the leading international training courses. His *QUALITY CONTROL HANDBOOK* (Third Edition 1974), his *QUALITY PLANNING AND ANALYSIS* (with Dr. F. M. Gryna, J., Second Edition 1980, and his training book *MANAGEMENT OF QUALITY CONTROL* (Fourth Edition, 1980) have collectively been translated into thirteen languages: Chinese, French, German, Hungarian, Italian, Japanese, Korean, Polish, Portuguese, Romanian, Russian, Serbo-Croatian and Spanish. He has conducted the course "Management of Quality Control" over 300 times in the last 35 years, in over 30 countries on all continents, providing a training input to over 20,000 managers and specialists.

In the field of general management, Dr. Juran's book *MANAGERIAL BREAK-THROUGH* generalizes the principles of creating beneficial change (breakthrough) and of preventing adverse change (control). His book *THE CORPORATE DIRECTOR* (with J. K. Loudon) generalizes the work of the Board of Directors. Beyond his published books, he has authored over 200 published papers.

A holder of degrees in engineering and law, Dr. Juran maintains an active schedule as author and international lecturer while serving various industrial companies, governmental agencies and other institutions as a consultant. His honors include over thirty medals, fellowships, honorary memberships, etc., awarded by professional and honor societies in twelve countries. Of special interest is the Order of the Sacred Treasure, awarded by the Emperor of Japan.



GENERAL PAUL X. KELLEY, USMC

ASSISTANT COMMANDANT AND
CHIEF OF STAFF, U.S. MARINE CORPS



UNITED STATES MARINE CORPS

DIVISION OF PUBLIC AFFAIRS • HEADQUARTERS MARINE CORPS
WASHINGTON, D. C. 20380 • TELEPHONE (202) 694-4309

GENERAL PAUL X. KELLEY, USMC

General Paul X. Kelley is the Assistant Commandant of the Marine Corps and Chief of Staff, Headquarters Marine Corps, Washington, D.C.

General Kelley was born on November 11, 1928, in Boston, Mass. He graduated from Villanova University with a B.S. degree in Economics and was commissioned a Marine second lieutenant in June 1950.

In March 1951, after completing instruction at The Basic School, Quantico, Va., he served consecutively as a platoon leader, assistant battalion operations officer and assistant division training officer with the 2d Marine Division, Camp Lejeune, N.C. He was transferred to the USS SALEM, Flagship of the 6th Fleet, during September 1952, serving as the Executive Officer and then the Commanding Officer of the Marine Detachment for a period of 20 months. He was promoted to captain on Dec. 16, 1953.

He was ordered to Camp Pendleton, Calif., in July 1954, where he served as a battalion executive officer with the 1st Infantry Training Regiment. Transferred to Japan in February 1955, he served as the Division Training Officer, 3d Marine Division. From August 1955 to June 1956, he served as the Aide-de-Camp to the Deputy Commanding General, and then as Assistant Force Training Officer, Fleet Marine Force, Pacific, in Hawaii.

Returning to the U.S. in July 1956, General Kelley became the Special Assistant to the Director of Personnel at Headquarters Marine Corps, Washington, D.C., until December 1957. Following his assignment in Washington, he completed the Airborne Pathfinder School at Ft. Benning, Ga. In February 1958, he was assigned to the newly activated 2d Force Reconnaissance Company, Force Troops, Fleet Marine Force, Atlantic, Camp Lejeune, where he served as the Executive Officer and then Commanding Officer.

From September 1960 to May 1961, he was the U.S. Marine Corps Exchange Officer with the British Royal Marines. During this tour he attended the Commando Course in England, served as Assistant Operations Officer with 45 Commando in Aden, and as Commander "C" Troop, 42 Commando in Singapore, Malaya and Borneo. On March 1, 1961, he was promoted to major.

He was assigned to Marine Corps Schools, Quantico, in July 1961, and served there as a tactics phase chief at The Basic School; and then Reconnaissance and Surveillance Officer at the Marine Corps Landing Force Development Center.

In June 1964, he assumed duties as Commanding Officer, Marine Barracks, Newport, R.I. He remained at that post until August 1965, when he was transferred to Vietnam and reported to the 3d Marine Amphibious Force, FMF, Pacific, as the Combat Intelligence Officer. Following this assignment, he served as the Commanding Officer, 2d Battalion, 4th Marine Regiment in Vietnam. He was promoted to lieutenant colonel on Jan. 20, 1966. During this tour as battalion commander, he earned the Silver Star Medal, the Legion of Merit with Combat "V" and two awards of the Bronze Star Medal with Combat "V".

From Vietnam, he proceeded to the U.S. Army Infantry School at Ft. Benning, where he served from August 1966 to July 1968, as the Senior Marine Corps Representative of the Commandant of the Marine Corps. He then attended the Air War College, Maxwell Air Force Base, Ala., graduating as a "Distinguished Graduate" in May 1969. For his excellence in politico-military strategy while a student at the Air War College, the Board of Trustees of the National Geographic Society elected him a life member.

He returned to Headquarters Marine Corps in June 1969, as the Military Assistant to the Assistant Commandant. He was promoted to colonel on April 1, 1970, and in June 1970 was reassigned to Vietnam where he commanded the 1st Marine Regiment, 1st Marine Division. General Kelley redeployed the regiment, the last Marine ground combat unit to leave Vietnam, to Camp Pendleton, Calif., in May 1971. During his second tour in Vietnam, he was awarded a second Legion of Merit with Combat "V".

Reassigned to the Washington area in July 1971, General Kelley served as the Chief, Southeast Asia Branch, Plans and Policy Directorate, Organization of the Joint Chiefs of Staff, where he remained until November 1973, when he was assigned as the Executive Assistant to the Director, Joint Staff. Upon completion of this tour he was awarded a third Legion of Merit.

Following his promotion to brigadier general on Aug. 6, 1974, he was assigned as the Commanding General, 4th Marine Division.

In June 1975, General Kelley was ordered to the Marine Corps Development and Education Command, at Quantico, where he assumed the duties as Director, Development Center. He assumed duties as Director, Education Center and was advanced to the grade of major general on June 29, 1976.

In May 1978, General Kelley was ordered to Headquarters Marine Corps, where he became Deputy Chief of Staff for Requirements and Programs.

On Feb. 4, 1980, General Kelley was promoted to lieutenant general and appointed by the President as the first Commander of the Rapid Deployment Joint Task Force, a four service force with headquarters at MacDill AFB, Tampa, Florida.

General Kelley was promoted to the rank of general and assumed duties as Assistant Commandant of the Marine Corps and Chief of Staff on July 1, 1981.

General Kelley's personal decorations and awards include: the Silver Star Medal; Legion of Merit with Combat "V" and two gold stars in lieu of second and third awards; the Bronze Star Medal with Combat "V" and a gold star in lieu of a second award; the Joint Service Commendation Medal; Navy Commendation Medal; and the Army Commendation Medal. He is a Marine Corps Parachutist and U.S. Army Master Parachutist.

General Kelley and his wife, the former Barbara Adams of Fall River, Mass., have a daughter, Mrs. John Cimko.

(Revised March 1982 HQMC)



REAR ADMIRAL WAYNE E. MEYER, USN

PROJECT MANAGER
AEGIS SHIPBUILDING

REAR ADMIRAL WAYNE MEYER, USN
PROJECT MANAGER, AEGIS
NAVAL SYSTEMS COMMAND (PMS-400)
WASHINGTON, DC 20361

29 June 1982

RADM WAYNE E. MEYER

Rear Admiral Wayne E. Meyer, a native Missourian, is the Project Manager for AEGIS Shipbuilding. His Navy career began on 12 May 1943 as an apprentice seaman. He was commissioned an Ensign in the U. S. Naval Reserve in 1946 and was transferred to the regular Navy in 1948.

Rear Admiral Meyer graduated from the University of Kansas in 1946 with a Bachelor of Science Degree in Electrical Engineering. He also holds a B. S. in Electronics Engineering and a M. S. in Astronautics and Aeronautics from the Massachusetts Institute of Technology, along with a B. S. in Electrical Engineering from the Naval Post Graduate School.

His first sea duty was as Electronics Officer and Combat Information Center/Fighter Director Officer in the radar picket destroyer GOODRICH (DDR-831). Consecutive sea tours followed in the 6 inch gun cruiser SPRINGFIELD (CL-66) and the Destroyer Tender SIERRA (AD-18).

From 1951 through 1955, he attended the Guided Missile School at Fort Bliss, Texas, the Naval Line School at Monterey, California, and served as instructor at the Navy's newly created Special Weapons School, Norfolk, Virginia.

RADM Meyer returned to sea in 1955 as Executive Officer, Navigator, and Senior Air Controller in the radar picket STRICKLAND (DER-33). He then served as Assistant Operations and Plans Officer and Special Weapons Officer on the staff Commander, Destroyer Force, Atlantic.

In 1958 he returned to Graduate School at Monterey, California followed by a year at MIT. He was ordered to the TALOS guided missile cruiser GALVESTON (CLG-3) as Fire Control and Weapons Officer. Following his tour in GALVESTON, he reported to the Surface Missile Systems Project of the Naval Material Command as Fire Control and Anti-Air Warfare Modernization Manager of the TERRIER Guided Missile Ships. He transferred to the Ordnance Engineering Corps in 1965.

In 1967, he reported as director of Engineering at the Naval Ship Weapons System Engineering Station at Port Hueneme, California. In 1970, he came to the Naval Ordnance Systems Command in Washington, D. C. as Weapons System manager in charge of development of the AEGIS Weapons System. He became Project Manager for Surface Missile Systems in 1972. With the establishment of the Naval Sea Systems Command in July 1974, he was also assigned as the first Director of Surface Warfare Systems.

RADM Meyer was selected for flag rank in January 1975. In July 1975 he assumed duties as Project Manager, AEGIS Shipbuilding. This position assigns him responsibility for research, engineering, design, construction and lifetime support for all AEGIS ships and combat systems. AEGIS ships presently include the CG-47 class guided missile cruisers and the DDG-51 class guided missile destroyers.

RADM Meyer's personal decorations and service medals include: Distinguished Service Medal, Meritorious Service Medal, China Service Medal, American Campaign Medal, World War II Victory Medal, Navy Occupation Service Medal, National Defense Medal with Bronze Star, Navy Meritorious Unit Commendation Ribbon with Bronze Star, Vietnam Service Medal and the Republic of Vietnam Campaign Medal with clasp. He also holds the American Society of Naval Engineers Gold Medal and was recognized in 1981 by the University of Kansas with its Distinguished Engineer Award. He holds Naval Ordnance Engineer Certificate #99. He is also an Associate Fellow in the American Institute of Aeronautics and Astronautics.

He is the son of Mr. and Mrs. Eugene (Nettie) Meyer of Brunswick, Missouri. He is married to the former Margaret Garvey of Dorchester, Massachusetts. They live in Falls Church, Virginia and have three grown children.



MR. THOMAS J. MURRIN

PRESIDENT
ENERGY AND ADVANCED TECHNOLOGY GROUP
WESTINGHOUSE ELECTRIC CORPORATION

WESTINGHOUSE ELECTRIC COMPANY
GATEWAY CENTER, WESTINGHOUSE BLDG.
PITTSBURGH, PA 15222

THOMAS J. MURRIN
President
Energy and Advanced Technology Group
Westinghouse Electric Corporation

As President of the Energy and Advanced Technology Group, Thomas J. Murrin is responsible for Westinghouse worldwide operations in aerospace and defense systems, such as radar, electronic countermeasures and missile handling and launching; commercial nuclear reactors and nuclear fuel for power generation; generating equipment for electric utilities, including electric generators and turbines; and advanced electronics technology, such as robotics and people-moving systems.

Elected to this position in February 1983, he is a member of the Westinghouse Management Committee, the top policy and decision-making body of the Corporation.

Mr. Murrin earned a bachelor of science degree in Physics from Fordham University in 1951 and has done graduate work at several universities, including the University of Pittsburgh, Pennsylvania State University, the University of Georgia, and Carnegie-Mellon University.

He joined the Westinghouse Transformer Division in Sharon, Pennsylvania, in 1951 as a materials engineer and later became superintendent of factory engineering and manufacturing. He also served as superintendent of factory planning at the Distribution Transformer plant in Athens, Georgia. In 1959, Mr. Murrin was appointed the Westinghouse European Manufacturing Representative, headquartered in Geneva, Switzerland. He returned to the United States in 1961 and became General Manager of the Motor and Gearing Division in Buffalo, New York.

In 1965, Mr. Murrin was elected Corporate Vice President of Manufacturing. He was named Executive Vice President of the Defense and Public Systems Group in 1971 and, in 1974, he became Senior Executive Vice President of the Group. In 1975, he was elected President of the Public Systems Company.

Mr. Murrin's activities involve foreign travel to over 35 countries -- including Australia, Brazil, Canada, 20 European countries, Hong Kong, Indonesia, Iran, Japan, Korea, Malaysia, Mexico, Morocco, Nigeria, Saudi Arabia, Singapore and Venezuela.

Mr. Murrin is a member and past Chairman of the Board of Governors of the Aerospace Industries Association. He is a member of the Secretary of Defense's Defense Policy Advisory Committee on Trade and a member of the U.S. Army's Science Board. Mr. Murrin has recently completed a term as a member of the Board of Visitors of the Department of Defense's Defense Systems Management College and has also served a term as a member of the U.S. NATO Industry Advisory Group.

Mr. Murrin serves as Chairman of the Board of Trustees of Pittsburgh's Mercy Hospital -- and is Chairman of the University Relations Committee of the Board of Directors of Duquesne University, also in Pittsburgh.

Among Mr. Murrin's honors are the Encaenia Award from Fordham University, in 1956; the Westinghouse Order of Merit, in 1968; Fordham University's Annual Achievement Award in Business in 1976; the National Leadership Award from the American Productivity Center, in 1981; and the 1982 James Forrestal Memorial Award of the National Security Industrial Association.

He is married to the former Dee Coyne of New York City, and their home is in Pittsburgh's North Hills suburban area. The Murrins have eight children.

A native of New York City, Mr. Murrin was born on April 30, 1929.



MR. DAVID PACKARD

CHAIRMAN OF THE BOARD
HEWLETT-PACKARD COMPANY

1501 PAGE MILL ROAD
PALO ALTO, CA 94305

April 30, 1982

BORN: September 7, 1912 Pueblo, Colorado

MARRIED: Lucile (Salter) Packard April 8, 1939

EDUCATION: Stanford University - B.A. 1934
Stanford University - E.E. 1939

HONORARY
DEGREES: Doctor of Science, Colorado College, 1964
Doctor of Laws, University of California, 1966
Doctor of Laws, Catholic University, 1970
Doctor of Laws, Pepperdine University, 1972
Doctor of Letters, Southern Colorado State College, 1973
Doctor of Engineering, University of Notre Dame, 1974

BUSINESS: Hewlett-Packard Company, 1501 Page Mill Road, Palo Alto, CA
Co-founder and Partner 1939-1946
President 1947-1964
Chairman of the Board and Chief Executive
Officer 1964-1968
U. S. Deputy Secretary of Defense, Washington, D.C.
Jan. 1969 - Dec. 1971
Hewlett-Packard Company, Chairman of the Board,
Jan. 1972-

DIRECTOR: (Current only)

Caterpillar Tractor Co. 1972-
Standard Oil Company of California 1972-
The Boeing Co. 1978 -
Genentech, Inc. 1981 -

David Packard
Page 2

TRUSTEE:

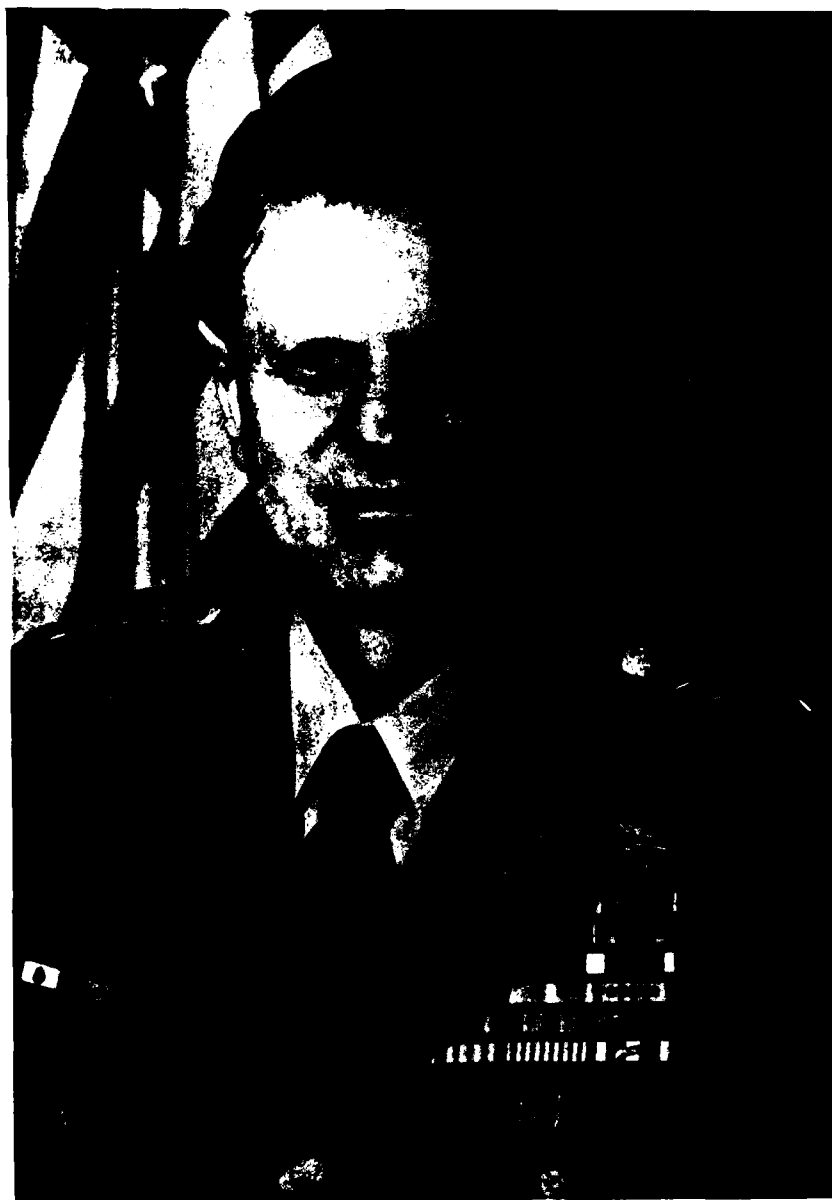
Herbert Hoover Foundation
American Enterprise Institute
Institute for Educational Affairs

ACTIVITIES:

President, Board of Regents, Uniformed
Services University of the Health Sciences
The Trilateral Commission (1973-1981)
Fellow, Institute of Electrical and
Electronics Engineers
Member, National Academy of Engineering
Lifetime Member, Instrument Society of America
Member, The Business Council (Past Chairman,
(December 1972 - December 1974)
Member, The Wilson Council
Member, The Business Roundtable
Member, Industries Advisory Committee,
The Advertising Council, Inc.
Member, US-USSR Trade & Economic Council
Committee on Science & Technology
Member, Board of Overseers, Hoover Institution
Committee on the Present Danger (1975-1981)
Founding Vice-Chairman, The California
Roundtable
Director, Alliance to Save Energy
Director, Foundation for the Study of
Presidential and Congressional Terms
Vice Chairman, Santa Clara County
Manufacturers Group
Vice Chairman, The Atlantic Council
(Director 1972-November 1980)
Presidential Advisory Board, Colorado State
University at Fort Collins
Member, White House Science Council
Director, Wolf Trap Foundation (Vienna, VA)
Director, The Nature Conservancy

CLUBS:

San Francisco: Bohemian, Commonwealth,
Engineers Club, Pacific Union, World Trade
Los Angeles: California Club
Washington, D.C.: Alfalfa Club, Capitol Hill
New York: The Links



GENERAL WILLIAM ROWLAND RICHARDSON, USA

**COMMANDING GENERAL, UNITED STATES ARMY
TRAINING AND DOCTRINE COMMAND**

As of 11 March 1983

RESUME OF SERVICE CAREER
of
WILLIAM ROWLAND RICHARDSON, General

DATE AND PLACE OF BIRTH: 25 March 1929, Taichow, Kiangsu, China

YEARS OF ACTIVE COMMISSIONED SERVICE: Over 28

PRESENT ASSIGNMENT: Commanding General, United States Army Training and Doctrine Command, Fort Monroe, Virginia since March 1983

MILITARY SCHOOLS ATTENDED:

The Infantry School, Basic and Advanced Courses
Canadian Army Staff College
United States Command and General Staff College
Armed Forces Staff College
Industrial College of the Armed Forces

EDUCATIONAL DEGREES:

United States Military Academy - BS Degree - Military Engineering
George Washington University - MSBA Degree - Business Administration

MAJOR PERMANENT DUTY ASSIGNMENTS: (Last 10 Years)

	<u>FROM</u>	<u>TO</u>
Student, Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, DC	Aug 67	Jun 68
Student, George Washington University, Washinton, DC	Jun 68	Aug 68
Team Chief, Operational Analysis Team, Studies and Models Group, Force Planning Analysis Directorate, later Executive, Office of the Assistant Vice Chief of Staff, United States Army, Washington, DC	Aug 68	Jun 70
Commanding Officer, 198th Infantry Brigade, 23d Infantry Division, United States Army, Vietnam	Jul 70	Mar 71
Chief of Staff, 23d Infantry Division, United States Army, Vietnam	Apr 71	Nov 71
Deputy Commanding General, United States Army Training Center (Engineer) and Fort Leonard Wood, Missouri	Dec 71	Jul 72
Assistant Commandant, United States Army Infantry School, Fort Benning, George	Jul 72	Dec 74
Commanding General, 193d Infantry Brigade (Canal Zone)/ Commander, United States Army Security Assistance Agency, Latin America, Fort Amador, Canal Zone	Dec 74	Jul 77
Director, Requirements, Office, Deputy Chief of Staff for Operations and Plans, U.S. Army, Washington, DC	Jul 77	Oct 79
Deputy Commanding General, U.S. Army Training and Doctrine Command, Fort Monroe, VA; Commander, U.S. Army Combined Arms Center; Commander, U.S. Army Combined Arms Combat Developments Activity; and Commandant, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas	Oct 79	Aug 81
Deputy Chief of Staff for Operations, U.S. Army, Washington, DC	Aug 81	Mar 83
Commanding General, U.S. Army Training and Doctrine Command, Fort Monroe, VA	Mar 83	

WILLIAM ROWLAND RICHARDSON, General

<u>PROMOTIONS</u>	<u>DATES OF APPOINTMENT</u>	
	<u>Temporary</u>	<u>Permanent</u>
2LT		1 Jun 51
1LT	9 Dec 52	12 Jul 54
CPT	7 Dec 56	16 Dec 57
MAJ	7 Oct 60	1 Jun 65
LTC	20 May 64	1 Jun 72
COL	21 Nov 68	16 Mar 76
BG	1 Jun 72	28 Jul 77
MG	1 Aug 75	1 Jun 79
LTG	10 Oct 79	
GEN	28 Feb 83	

U.S. DECORATIONS/BADGES:

Silver Star (with Oak Leaf Cluster)
 Legion of Merit (with 2 Oak Leaf Clusters)
 Distinguished Flying Cross
 Bronze Star Medal with V Device (with 3 Oak Leaf Clusters)
 Air Medals with V Device
 Army Commendation Medal (with 2 Oak Leaf Clusters)
 Purple Heart
 Combat Infantryman Badge (2d Award)
 Parachutist Badge
 General Staff Identification Badge

SOURCE OF COMMISSION: USMA

GENERAL WILLIAM R. RICHARDSON, USA
 COMMANDING GENERAL
 U.S. ARMY TRAINING DOCTRINE COMMAND
 (USA TRADOC)
 FT. MONROE, VA 23651



MR. GEORGE A. SAWYER

**ASSISTANT SECRETARY OF THE NAVY
SHIPBUILDING AND LOGISTICS**

**CRYSTAL PLAZA 5, SUITE 266
WASHINGTON, DC 20360**

BIOGRAPHY

GEORGE A. SAWYER
ASSISTANT SECRETARY OF THE NAVY
(SHIPBUILDING AND LOGISTICS)

On 19 May 1981, President Reagan announced the selection of George A. Sawyer to be the Assistant Secretary of the Navy for Shipbuilding and Logistics. He was confirmed by the Senate on 16 June 1981 and took the oath of office on 23 June 1981.

Mr. Sawyer is a 1953 graduate of Yale University and has been associated with major marine, engineering and construction projects for many years.

While serving with the U. S. Navy, Mr. Sawyer was an early participant in the nuclear submarine program, including the prototype development and initial service operation of the first multi-nuclear propulsion installation.

In 1963, Mr. Sawyer joined Babcock & Wilcox as Nuclear Power Coordinator - Marine Projects, where he was involved in the development and application of the NS SAVANNAH and other nuclear ship projects. He is a co-inventor of the Consolidated Nuclear Steam Generator. He subsequently held the position of Manager, Marine Systems with NUS Corporation and Batelle Memorial Institute.

In 1969 he joined Bechtel Incorporated as Manager of Environmental Systems and held a number of management positions with that Company. His last position was as Manager of Eastern Operations and Vice President of International Bechtel Inc., responsible for Bechtel's port and other major transportation projects in the Middle East.

Mr. Sawyer served as President and Chief Executive Officer of John J. McMullen Associates, Inc., from September 1976 to April 1981.

He is the author of several technical papers. He is a member of the American Society of Naval Engineers and the Society of Naval Architects and Marine Engineers, and is on the Committee on Nuclear Applications of the American Bureau of Shipping. Mr. Sawyer also served on the Board of Directors of the Shipbuilders Council of America.

He was born on 20 April 1931, in New York. He is currently residing in Alexandria, Virginia.

September 1982

Howard K. Smith

It characterizes Howard K. Smith's stature as a journalist that he was chosen above all his colleagues to moderate two television debates that are widely thought to have been decisive in two Presidential elections: the first Kennedy-Nixon debate in 1960, and the Carter-Reagan "Great Debate" in 1980. Also, he is the only newsman ever to be invited to address the House of Representatives, on Flag Day in 1975.

Howard K. Smith has won every important award given for excellence in broadcasting. He received the Peabody Award and an "Emmy" for the documentary program "The Population Explosion". He is the only journalist who has been awarded the DuPont Commentary Award twice. He has won the Overseas Press Club Award for reporting and interpreting foreign affairs six times, more than any other commentator. He was the first working newsman to receive the "Paul White Memorial Award", which up to that time had been given only to Presidents of the United States, and to one network president. When the Friars' Club presented its "Oscar" to the three "outstanding American broadcast journalists", they were: Walter Cronkite, David Brinkley and Howard K. Smith.



Outside the field of Broadcasting, Howard K. Smith has received 15 honorary degrees of doctorates from American Universities. As a public speaker, he was given the prestigious Lowell Thomas Award by the International Platform Association.

A native of Ferriday, Louisiana, Howard K. Smith graduated from Tulane University, then won a Rhodes Scholarship and attended Oxford University in England. He began his career as a newspaperman, first on the New Orleans Item, then with the United Press, and later with the New York Times. In 1941 he joined the Columbia Broadcasting System as its wartime Berlin correspondent, and remained with that network for 20 years. In 1961, he switched to the American Broadcasting Company where he reported for 17 years.

As a CBS War Correspondent he was expelled from Nazi Germany late in 1941, and authored the best-selling book "Last Train from Berlin." Throughout World War II, he covered four different armies. He followed the Nazi Wehrmacht in its conquest of France. He covered the French underground army in its re-conquest of France. He was assigned to the U.S. First and Ninth Armies in their drive through Belgium, Holland and West Germany. And he covered the surrender of the Germans to the Soviet Red Army in Marshall Zhukov's headquarters outside Berlin. At the end of the war, he reported on the Nuremberg War Crimes Trials. In 1946, Edward R. Murrow appointed Smith to be his successor as CBS's Chief European Correspondent. From his London base, he travelled in and reported from all the nations of Western Europe and Communist Europe. He summarized the effects of war on Europe in his second book, "The State of Europe." Gradually his beat was extended to the Middle East and Africa. In 1957, he was transferred to Washington, where he became CBS's Chief Washington Correspondent, and Manager of CBS's Washington Bureau.

In 1961 Howard K. Smith joined the American Broadcasting Company to write, edit and narrate a prime time weekly television program of comment on current affairs called "News and Comment". Later he was assigned to 52 weekly programs devoted entirely to the Vietnam War. He was chosen by ABC to conduct the first one-on-one television interview with a President, Richard M. Nixon. For seven years, he served as co-anchorman of the network's main news program, the "ABC Evening News". His assignments in the capital induced him to write a third book, "Washington D.C.," a history of the nation's capital.

A fair comment on Mr. Smith's career is that of Current Biography: "Perhaps the most outspoken and uncompromising of the network news commentators is Howard K. Smith, the scholarly resident pundit of ABC's nightly newscasts who has, over the years, confounded his critics and his admirers with his unpredictable commentaries . . ."

At present Howard K. Smith is lecturing, speaking and accepting selected television assignments. In 1980, in addition to moderating the final Carter-Reagan Debate, he moderated all the debates in the primaries; and he broadcast a study of the modern presidency, entitled "Every Four Years", a series of one-hour television programs during which Mr. Smith interviewed all living presidents.

Howard K. Smith has played in many movies, including "The Best Man" with Henry Fonda, "The Candidate" with Robert Redford, and "Close Encounters of the Third Kind." When intervals permit, he is doing research on a book which will be a newsman's commentary on the twentieth century. He is married to Benedicte Traberg of Copenhagen, a former correspondent for a Danish newspaper. They have two children, Jack and Catherine, both are working as television correspondents.

HOWARD K. SMITH
6450 BROOKS LANE
BETHESDA, MD 20816



THE HONORABLE PAUL THAYER
DEPUTY SECRETARY OF DEFENSE

PENTAGON
WASHINGTON, DC 20301

Paul Thayer
Deputy Secretary of Defense

Paul Thayer was nominated by President Reagan to be Deputy Secretary of Defense on December 6, 1982, was confirmed by the United States Senate on December 16, 1982, and took the oath of office on January 12, 1983.

Mr. Thayer was born in Henryetta, Oklahoma, on November 23, 1919. He attended Wichita State University from 1937 to 1938 and graduated from the University of Kansas in 1941.

In 1941, prior to Pearl Harbor, he enlisted in the Navy's Aviation Cadet Program. He received his wings and commission as an ensign in March 1942 and served as a fighter pilot during World War II, becoming a combat ace. When he resigned his active commission at the rank of lieutenant commander in September 1945, his tally record as a fighter pilot was six enemy planes shot down, four other probable kills and nine more destroyed on the ground. For his combat service he was awarded three Distinguished Flying Crosses and ten Air Medals.

From 1945 to 1947 he was a co-pilot for Trans World Airlines later joining Chance Vought Aircraft in 1948 as a production test pilot. In 1950, he joined Northrop Aircraft as chief experimental flight test pilot but returned to Chance Vought after a year to become chief of Chance Vought's flight test department and the company's manager for sales and service. In 1955, he became vice president for sales and service and was also appointed to the board of directors. From 1958 to 1959 Mr. Thayer was vice president of foreign sales operations in Washington, D.C., and in 1959, returned to Dallas and assumed the position of vice president and general manager for Chance Vought's Aeronautics Division.

In 1961, Chance Vought merged with an electronics company to become Ling-Temco-Vought (LTV), Inc. At this time, Mr. Thayer became president of Chance Vought and a director of LTV. Four years later, he assumed the position of president of LTV Aerospace Corporation, and 1970, chairman of the board and chief executive officer of the LTV Corporation.

Mr. Thayer was the chairman of the board of directors for the U.S. Chamber of Commerce and Chairman of the National Explorer Scout Committee. He is a member of the Society of Experimental Test Pilots.

He is married to Margery Schwartz Thayer. They have one daughter, Brynn Thayer Anthony.



Biography

United States Air Force

Secretary of the Air Force, Office of Public Affairs, Washington, D.C. 20330

MAJOR GENERAL WILLIAM E. THURMAN

Major General William E. Thurman is deputy for B-1B, Aeronautical Systems Division at Wright-Patterson Air Force Base, Ohio.

General Thurman was born in Hodgenville, Ky. He attended secondary school in central Kentucky and graduated from Danville (Ky.) High School. He graduated from the U.S. Naval Academy, Annapolis, Md., in 1954 with a bachelor of science degree and was commissioned as a second lieutenant in the U.S. Air Force. He earned a master of science degree in aeronautical engineering from the Air Force Institute of Technology at Wright-Patterson Air Force Base in 1962, and a master of administration degree in management engineering from The George Washington University, Washington, D.C., in 1971. The general completed Squadron Officer School at Maxwell Air Force Base, Ala., in 1959; Army Command and General Staff College at Fort Leavenworth, Kan., in 1965; Industrial College of the Armed Forces at Fort Lesley J. McNair, Washington, D.C., in 1975; and the Stanford University executive program in 1977. He also attended the University of Kentucky and Ohio State University.



He entered active duty in the U.S. Air Force in June 1954. From June 1954 to February 1956, he received pilot training at Spence Air Base, Ga., and Laredo Air Force Base, Texas, and fighter gunnery training at Laughlin Air Force Base, Texas, and Luke Air Force Base, Ariz. He then served as an RF-84 pilot at Kadena Air Base, Okinawa, until May 1958.

Following two months instructor training at Craig Air Force Base, Ala., the general was assigned to the 3576th Pilot Training Squadron at Vance Air Force Base, Okla. In February 1961 he entered the Air Force Institute of Technology and upon graduation in October 1962, he was assigned as an aeronautical engineer in the Aerospace Research Laboratories, also at Wright-Patterson Air Force Base. General Thurman graduated from the Army Command and General Staff College in July 1965, and transferred to Ent Air Force Base, Colo., as a staff officer at Air Defense Command headquarters.

From November 1966 to October 1967, he served in Southeast Asia, initially as an F-105 fighter pilot and flight commander with the 469th Tactical Fighter Group at Korat Royal Thai Air Force Base, Thailand. He then became an operations staff officer at 7th Air Force headquarters, Tan Son Nhut Air Base, Republic of Vietnam.

Upon his return to the United States, General Thurman was assigned, from October 1967 to August 1971, at Headquarters U.S. Air Force, Washington, D.C. The general was first assigned as a foreign development officer in the Office of the Deputy Chief of Staff for Research and

(Current as of August 1982)

Development. In October 1969 he was named aerospace assistant to the National Aeronautics and Space Council, Executive Office of the President.

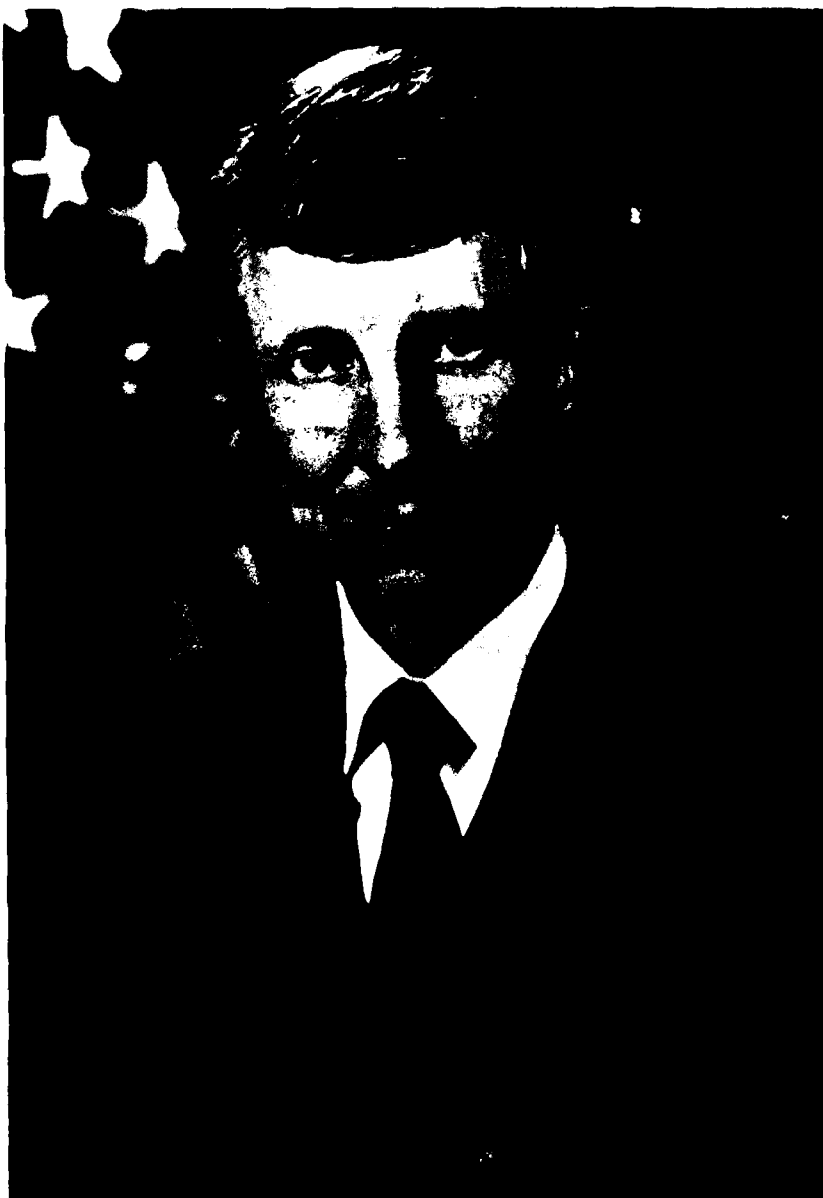
He was assigned to the Aeronautical Systems Division for the first time in August 1971 as assistant director and a charter member of the Prototype Program Office. He was named deputy for prototypes in June 1973, deputy for air combat fighter in May 1974, deputy for F-16 in January 1975 and deputy for engineering in May 1976.

In May 1978 General Thurman was assigned to the Electronic Systems Division at Hanscom Air Force Base, Mass., as deputy for control and communications systems. The general was then named commandant of the Defense Systems Management College at Fort Belvoir, Va. He assumed his present duties in December 1981.

General Thurman is a command pilot with more than 3,200 flying hours and 56 combat missions. His military decorations and awards include the Legion of Merit with two oak leaf clusters, Distinguished Flying Cross with one oak leaf cluster, Bronze Star Medal, Defense Meritorious Service Medal, Air Medal with four oak leaf clusters, Purple Heart and Air Force Outstanding Unit Award ribbon with one oak leaf cluster. He received the Air Force Association's Meritorious Award for Program Management in 1976.

He was promoted to major general June 1, 1982, with same date of rank.

General Thurman and his wife, the former Joan M. Hellmann of St. Louis, have two sons, Rhett and Christian.



DR. JAMES P. WADE, JR.

PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE
RESEARCH AND ENGINEERING

THE PENTAGON
WASHINGTON, DC 20301

BIOGRAPHY OF DR. JAMES P. WADE, JR.

James Paul Wade, Jr., was born in Richmond Heights, Missouri, December 26, 1930. He received a B.S. degree in Engineering from the United States Military Academy, West Point, New York, in 1953; an M. S. in Physics in 1959, and a Ph.D in Physics in 1961 from the University of Virginia, Charlottesville, Virginia. He graduated from the U.S. Army Command and General Staff College in 1966.

During the period 1955-1957, Dr. Wade was a member of the staff of the NATO Defense College in Paris, France. In 1961, he was assigned to the Physics Staff of the Lawrence Radiation Laboratory, University of California, Livermore, California. In 1966, he was assigned to the J-3 Operations Directorate, USCINCEUR, Paris, France. Dr. Wade was appointed a Staff Specialist in the Strategic Technology Office of the Advanced Research Projects Agency, Arlington, Virginia, in 1967. In 1970, he joined the staff of the Deputy Director, Defense Research and Engineering (Strategic and Space Systems), Department of Defense. In 1972, Dr. Wade was appointed Assistant Director, OSD SALT Support Group, Office of the Director of Defense Research and Engineering. He participated as the Senior OSD Staff Advisor on the United States Delegation to the Strategic Arms Limitation Talks with the USSR. In 1973, he was assigned the additional task of Assistant Director, Net Technical Assessment.

In June and July 1974 respectively, the Secretary of Defense appointed Dr. Wade to be the Director, Department of Defense Strategic Arms Limitation Talks (SALT) Task Force, and Deputy Assistant Secretary of Defense for Policy Plans and National Security Council Affairs. In January 1976, Dr. Wade was appointed the additional responsibility of Chairman of the National Security Council Defense Review Panel Working Group, in the Office of the Secretary of Defense.

On 8 August 1978, Dr. Wade was appointed as Assistant to the Secretary of Defense for Atomic Energy, and Chairman of the Military Liaison Committee to the Department of Energy. He also served as Vice Chairman of the Defense Science Board from August 1978 through October 1980.

Currently, Dr. Wade is the Principal Deputy Under Secretary of Defense for Research and Engineering.

In November 1975, Dr. Wade was awarded the Distinguished Civilian Service Medal by the Secretary of Defense. In January 1977, the Secretary of Defense presented Dr. Wade with the Department of Defense Medal for Distinguished Public Service for his role as Deputy Assistant Secretary of Defense Policy Plans and National Security Council Affairs; Chairman, National Security Council Defense Review Panel Working Group; and Director, Strategic Arms Limitation Talks (SALT) Task Force. In January 1981, Dr. Wade was awarded the Bronze Palm to the Department of Defense Medal for Distinguished Public Service, for his role as Assistant to the Secretary of Defense for Atomic Energy and Chairman of the Military Liaison Committee to the Department of Energy.



MR. WILLIAM J. WEISZ

**VICE CHAIRMAN OF THE BOARD
AND CHIEF OPERATING OFFICER
MOTOROLA INCORPORATED**

**MOTOROLA CENTER
1303 EAST ALGONQUIN ROAD
SCHAUMBURG, IL 60196**

**MOTOROLA INC.**

WILLIAM J. WEISZ
Vice Chairman of the Board
and Chief Operating Officer

William Weisz began his career with Motorola as a junior development engineer in 1948, following receipt of his bachelor's degree in electrical engineering from the Massachusetts Institute of Technology, and after service with the U.S. Navy in 1945-46 as an electronic technician.

Among his first assignments was work on early versions of the company's HANDIE TALKIE FM Radiophone. He was named manager of the Portable Communications Product line in 1954. In 1956, he became chief engineer for all mobile and portable communications products and manager of these product lines in 1958.

Weisz was elected a Motorola vice president in 1961. He was named assistant general manager of the Communications Division in 1964, and general manager the following year. In 1968, he was elected to the Board of Directors, and the next year he became executive vice president and assistant chief operating officer. He was elected president in 1970, and, in 1972, became chief operating officer. In 1980, Weisz was elected vice chairman of the board, continuing as chief operating officer.

Weisz has been an active contributor to professional and civic organizations.

In 1981 he was presented with the Electronic Industries Association's highest personal recognition, the Medal of Honor, by the EIA Board of Governors. The award recognizes outstanding contributions to the advancement of the electronics industry.

He has held a number of posts with the EIA: chairman of Technical Committee TR8 on Land Mobile Services, responsible for technical equipment standards for equipment and systems in all land mobile fields; past chairman of the Land Mobile Section, the policy-determining body of EIA in vehicular communications; past chairman of the Communications and Industrial Electronics Division; past chairman of the Association Board of Governors; and a past member of the Special Committee on Telecommunications Policy of the Board, which served as Advisory Committee to the Department of Transportation. In the latter capacity, Weisz was the

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official EIA representative to the Federal Highway Administration. He is a member of the National Academy of Sciences Panel on Advanced Technology Competition between the Industrialized Allies.

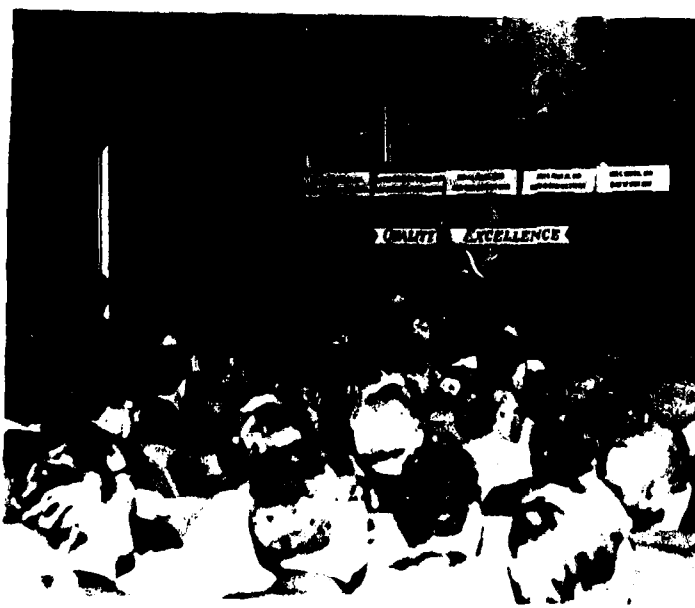
Other high posts have been held by Weisz in the national and Chicago chapters of the Institute of Radio Engineers and the Institute of Electrical and Electronics Engineers, including the chairmanship of the IEEE Professional Group on Vehicular Communication; the Federal Communications Commission Land Mobile Advisory Committee; and the Land Mobile Communications Council. He has authored numerous papers and received patents related to two-way radio communications.

Weisz became a Fellow of the Institute of Electrical and Electronics Engineers in 1966 and the Radio Club of America in 1976. In 1970, he received the National Electronics Conference Award of Merit.

He is active in the affairs of his alma mater, MIT, through membership on the MIT Corporation (Board of Trustees). He is on the Corporation Development Committee, the Visiting Committee for the Sloan School of Management, and member and past chairman of the Visiting Committee for Electrical Engineering and Computer Sciences. He received the MIT Corporate Leadership Award in 1976.

He holds an honorary doctorate of business administration from St. Ambrose College, Davenport, Iowa, granted in 1976.

He has been an officer in the Junior Chamber of Commerce, Junior Achievement and scouting. The Freedoms Foundation at Valley Forge awarded Weisz an honor certificate in 1975 for his efforts on behalf of the private enterprise system.





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